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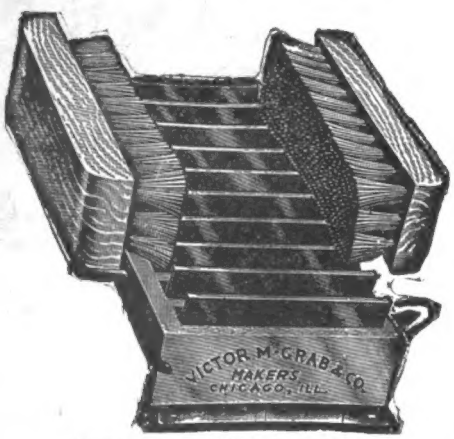

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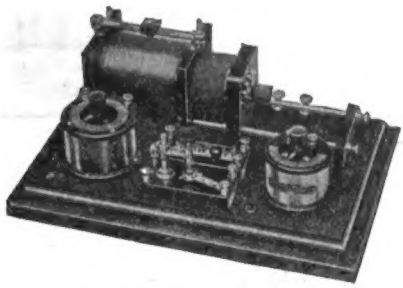

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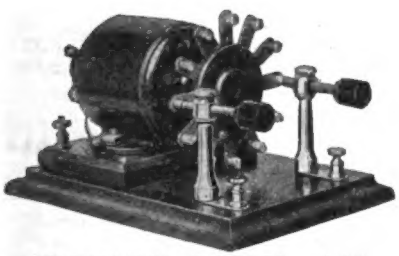

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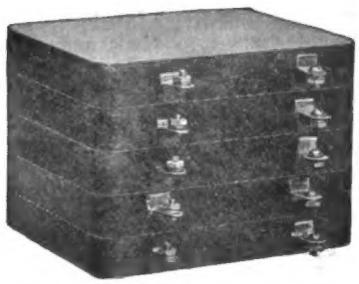

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Volume 28. **January, 1914** **No. 1**

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JANUARY, 1914 VOL. 28. No. 1.

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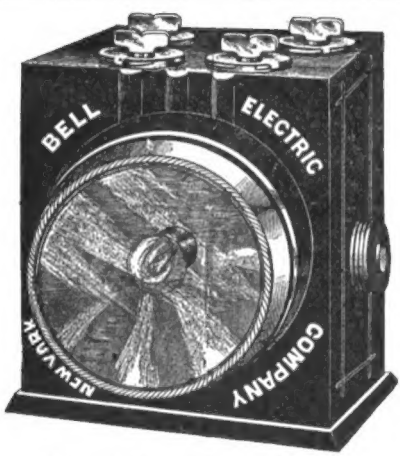

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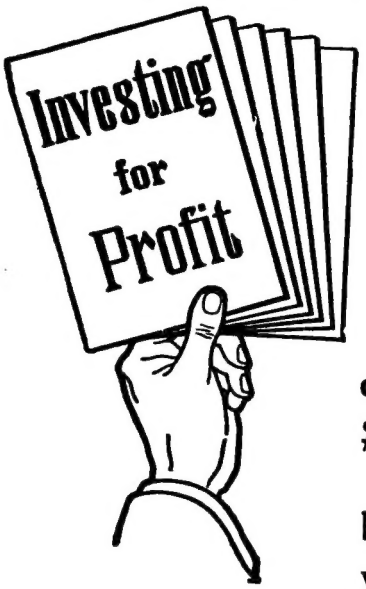

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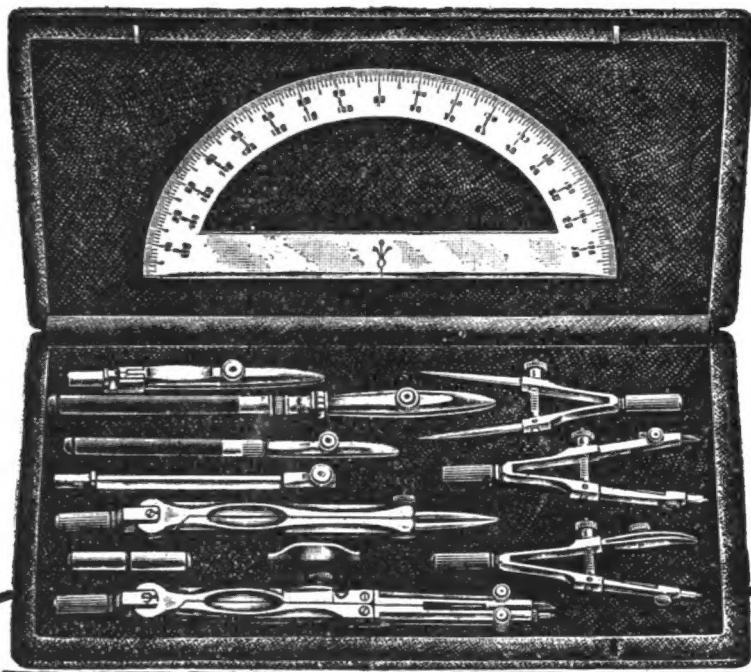

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Modern Electrics and Mechanics

VOL. XXVIII. January, 1914 No. 1

The Great Keokuk Dam

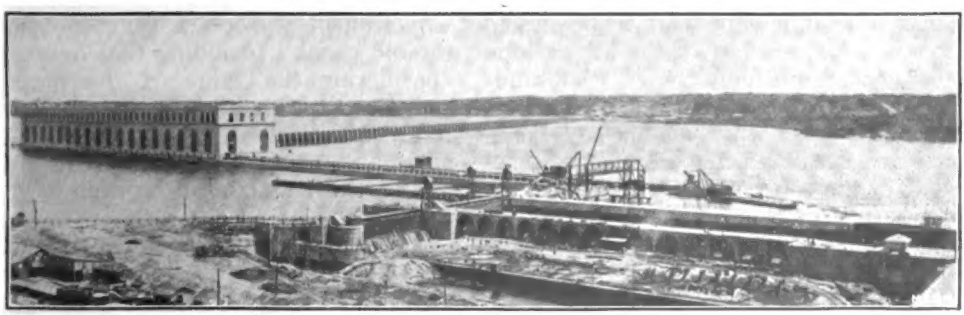
Harnessing and Transforming Into Electric Current the Onrush of the Mississippi River

By Will P. Green

Photos copyrighted by H. M. Anschutz

EXCEPT to the trained technical mind, bare figures carry little impression of the extent of a great engineering feat. To give the length, breadth and thickness of any one division of concrete construction in the great $27,000,000 power development dam across the Mississippi River, at Keokuk, Iowa, would hardly give more than a vague idea to the lay mind of the magnitude of the undertaking. If, on the other hand, it should be stated that from the river bed up, the power house, in which over 200,000 electric horsepower is generated, has the height of a fifteen-story skyscraper, and that in the construction of the project 650,000 barrels of cement were used, not to mention 10,000,000 feet of lumber in building coffer dams and molding forms, one would begin to realize that the Father of Waters has been set to the tasks of men by the greatest engineering achievement of modern times. Or it might be added still that the 300,000 cubic yards of sand that went into the work would fill a line of wagons stretching from New York City to the eastern line of Utah.

Extending from Keokuk to St. Louis is a transmission line that carries the cur-



GENERAL VIEW OF THE GREAT KEOKUK DAM AND THE POWER HOUSE

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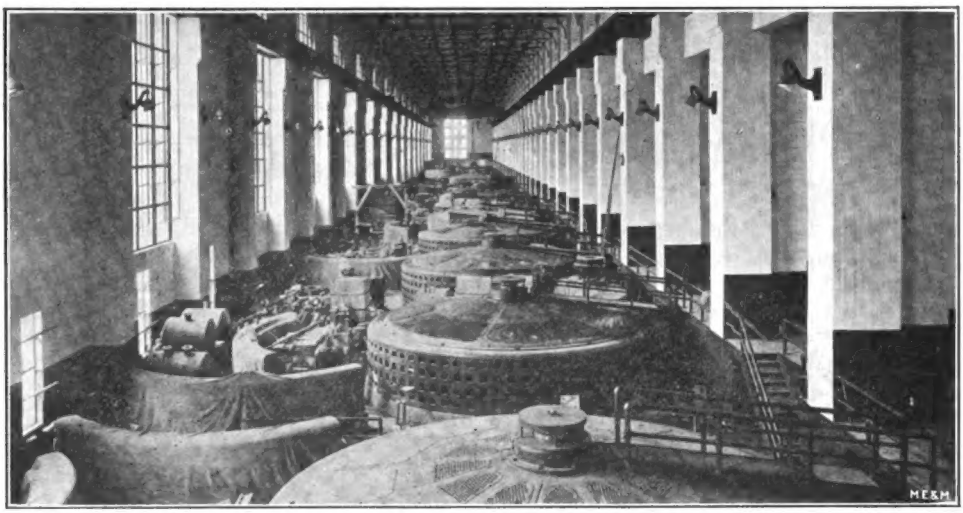
rent to the latter city for running the street cars of the Mound City, furnishing in all to that point 60 per cent. of the total power now being developed. In other directions as well, transmission lines have been strung, and the smaller towns and cities of this newly developed power zone are securing their lighting and general electric power from the Keokuk dam. The Mississippi Valley is enjoying an era of advanced power development—the forerunner of water power engineering in the Middle Western section.

Without a doubt the Keokuk dam is the biggest power plant ever constructed. The dam has often been compared to the engineering triumph of the Panama Canal, but this is not a logical comparison. The construction problems presented were entirely different. At Panama it was largely a question of excavation, while at Keokuk a concrete wall almost one mile long had to be locked into the limestone bed of the Mississippi, holding back the hundreds of thousands of tons of water for ages to come. Perhaps one reason why Keokuk and Panama have been so often compared is because of the construction of a lock in the Mississippi in connection with the dam that is similar to the locks built on the isthmus.

Congress stipulated, when the grant was given to build the dam at Keokuk, that the company should construct a lock and dry dock to handle steamboats plying on the northern Mississippi. The dam is located at the foot of the Des Moines Rapids, which necessitated the building and maintaining by the Government of a canal nine miles long with three locks. The old canal and its locks are now but a matter of history. In their place the power company constructed one big lock of the same width as those at Panama, 110 feet, and with a lift of forty feet—one-fourth higher than that at Panama. The new dry dock, the largest in the world in fresh water, replaces one of much smaller size, located at the middle lock of the old canal. Both the lock and the dry dock became the property of the Government on completion under an agreement whereby the power company is to furnish operating power free in perpetuity by means of a separate turbine plant. It had cost the Government $40,000 a year to operate the old canal. Including that figure and considering the value of the property ceded to the Government, it is conservatively estimated that the United States saves and makes from the Keokuk water power the equal of a capitalization of $7,500,000.



INTERIOR VIEW OF THE POWER HOUSE, SHOWING THE GIANT WATER TURBINES AND GENERATORS.

The Government was not interested in the lock and dry dock alone. Every part of the construction of the entire project was under the supervision of the

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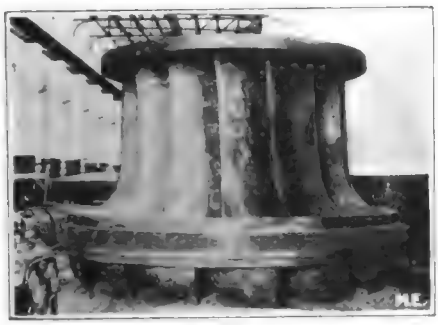
chief engineer of the War Department and his inspectors. The reason for that is not hard to find. The Government is extremely careful of anything that may interfere with river navigation, and one of the hardest problems that confronted the engineers was to determine how to hold back a sufficient amount of water to develop the desired power while at the same time not interfering with the stage of water below the dam to a point where steamboating would be injuriously affected. The problem of water level below the dam was worked out satisfactorily, while conditions above the dam were much improved. Because of the lake formed by the dam in holding back the water, the stage of the river is affected for sixty-five miles north, and the time made by steamboats between Keokuk and Montrose, a distance of twelve miles, has been shortened two hours. The lake has an area of one hundred square miles, and



ROTATING MEMBER OF ONE OF THE WATER TURBINES

its width varies from one and one-half miles to three and one-half miles. At the lower end the depth is fifty feet, while at the upper end the average depth is eight feet.

Naturally the big feature of the Keokuk water power is the dam itself. In the course of the twelve miles above Keokuk the water falls about twenty-four feet, and the rapids resulting therefrom were what necessitated the maintenance of the old canal. To throw a dam of concrete in the face of this mighty onrush of water—one which would withstand not only the force of the Mississippi, but also its varying conditions, such as the annual bombardment of ice and a temperature ranging from 110 degrees in summer to 30 degrees below zero in winter—required the skill of an engineering wizard.

Hugh Lincoln Cooper was the man who harnessed the Mississippi. Not yet fifty years of age and with the record of having built water powers in four foreign countries, not to mention his feat of driving a tunnel under the center of the

A SECTION OF THE DAM SHOWING SPILLWAYS

Horseshoe Falls at Niagara, Cooper worked out the situation at Keokuk to a point of perfect operation and set in motion the giant turbines on the day he designated when the work was started. There are numerous interesting incidents connected with Cooper's work at Keokuk, for he is a man of unusual personality. For instance, thirty-eight capitalists showed him out of their offices before he found a man willing to risk a dollar on the power that lay hidden in the Mississippi. When Cooper did find men with the capital and courage, they were foreigners for the most part. Sixty-five per cent. of the money furnished to build the

A VIEW OF THE LOCKS OF THE KEOKUK DAM

Keokuk dam came from Canada, England, Belgium and France.

Including the abutments, the dam is one mile long. There are 119 concrete

Google

spans. The piers are six feet thick, and the inside measurement of a span, that is, the distance between any two piers, is thirty feet. The viaduct topping the dam structure is twenty-nine feet wide, sufficient for the two railroad tracks to be built across it. At the bottom of the river the dam is forty-two feet wide. Its height is fifty-three feet.

Cooper found that to dam the Mississippi was one thing, but to take care of the river during the constructive period was quite another. Here, in brief, is how he did it. First, by coffer dam construction, he threw across the river the line of concrete piers. Not until the 119 spans were completed did he build the spillway sections. That is, when the piers were finished he constructed spillways between adjoining piers, shutting the water out of a part of the river approximately thirty feet wide, which is the distance between any two piers. Through this method the obstruction to the flow of the river at any one time was at a minimum, the water flowing through all other arches exactly as it passes between the piers of an ordinary river bridge.

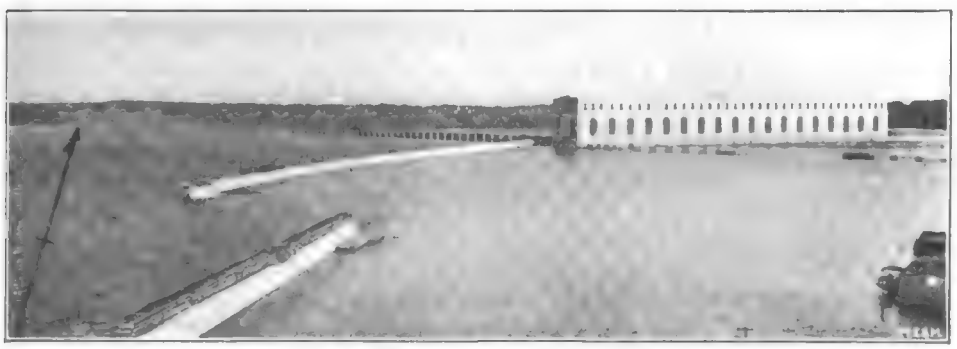
HUGH LINCOLN COOPER—THE ENGINEER THAT MADE THE KEOKUK DAM POSSIBLE

On the upper side of each span, slots were let into the sides and into the top of the spillway. In these slots were placed 119 steel gates which can be manipulated so as to form a complete obstruction to the water or govern the amount passing through the dam to the lower river. Thus, the gates will keep the water above the dam at a constant level, being opened during high water periods to let through the surplus.

On account of the great range of temperature to which reference has already been made, expansion joints were set in the top of the dam, sheets of tar paper being suspended vertically across the structure inside of steel molds when the concrete was poured in. When this paper rots out there will be a narrow fissure which will pull apart in cold weather and close up in hot weather. The expansion joints are necessary for surface work only. Experiments showed that the concrete under water would be affected but little by any change in temperature.

The ice fender at Keokuk, designed to stop the sudden breaking of ice floes and to hold them until they melt naturally in their native beds, is built of solid

(*Continued on page* 84)



VIEW OF THE POWER HOUSE AND ICE FENDER

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The Manufacture of Nails and Rivets

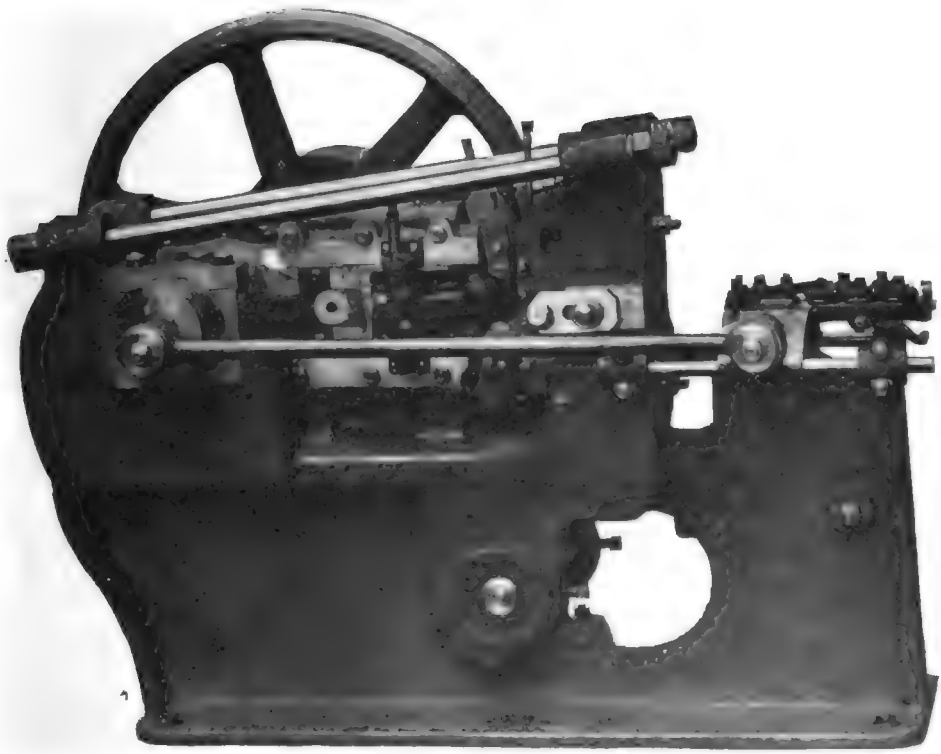
A Description of the Manufacturing of These Commodities of Everyday Use.

By LaRose Vandling

Illustrations by courtesy of the National Machinery Co.

NAILS and rivets, while common articles of everyday use, form an interesting study as regards their mode of manufacture, of which little is known by the average person.

The accepted description of a nail is that it is a slender, pointed piece of metal usually made with a head at one end and pointed at the other to facilitate the fastening together of wood or like material, by being driven through it. Nails and rivets are both named after the use for which they are intended, as well as after their shape, material or similar characteristics. For example, there are brads, spike, roofing nails, shoe nails, boiler rivets, copper rivets and split rivets. As a general rule, nails are referred to as four penny, ten penny, etc., meaning that a thousand four penny nails would weigh four pounds, a thousand ten penny nails would weigh ten pounds, and so on.



A MACHINE FOR MAKING NAILS AND RIVETS

A rivet performs usually the same function with metallic plates that the nail does with other material, although rivets are also employed to hold leather

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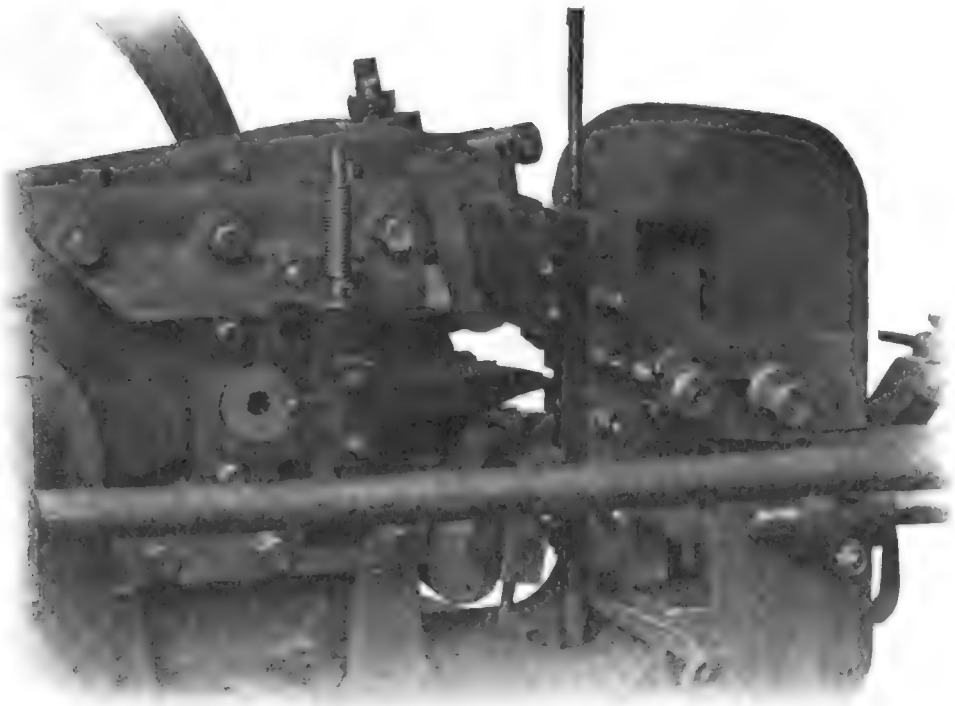
and different fabrics together. In general practice a rivet is used as a metal pin with a head. The headless end is passed through two or more plates of metal or pieces of other material, and is then hammered or pressed down so as to form a second head. In manufacturing, close attention is given to the making of rivets, as they are subjected later to various strains and stresses in actual use. The smaller sizes, used for a variety of purposes, are made cold; the material from which the rivet is made being fed through the machine the rivet-making machine comprising a piece of metal that forms the head —trouble is sometimes experienced in getting the rivet to kick out after the rivet head is made. This trouble is most pronounced when making large heads, but is overcome in a simple manner. The header is generally a round piece of tool steel which varies in size according to the size of the rivet head. It has one end cut out to the shape of the head to be made. A small hole about 3/16 inch diameter is drilled the entire length of the header,



CUTTING DIES AND HEADER OF THE NAIL AND RIVET MAKING MACHINE

cold and the head pressed on the rivet while in this condition. This process is quite satisfactory for small rivets, but in making larger ones no risks are taken, since the head must be absolutely free from any fracture or imperfection. To overcome this danger and insure perfect heads, the rods out of which the rivets are made are heated first in furnaces and then fed to the machine while still hot and the head is then formed on one end. In the construction of the header—that part of so as to form an air vent, which allows the escape of air and other gases formed in the header when the rivet head is being made. It would be supposed that this vent might make an additional projection on the rivet head and thus marr its appearance, but in a properly made header this is not the case.

Rivets which are used in boiler and structural work receive little attention after being made, as they are reheated again when used. But with the cold-

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made variety they are annealed to give them a "set" and render them more malleable. As the machines used to make rivets are similar to those employed in the manufacture of nails, nothing will be said further on the subject of rivets.

In the operation of nail machines the wire is placed on a reel near the machine and fed into the dies by the feed mechanism, the machine making a nail every revolution. Any gauge nail can be made up to the machine's limit by changing the gripping dies, and various lengths can be secured by simply changing the stroke of the rod connecting the main shaft with the straightener and feeder carriage.

In one of the two accompanying illustrations is shown a general view of a wire nail machine. In the other illustration is shown the die mechanism. In operation, the wire is fed between the straightener rolls into the dies. It is then gripped by the gripping dies and the head formed by the forward motion of the heading tool, after which the heading tool withdraws, the grip dies open and the feeder moves the wire forward to the length of the nail to be made. The grip dies again close to hold the wire and the cut-off dies shape the point and cut off the nail. The straightener dies then move back over the wire and at the same time the next head is being made as already described. A kick-out, operated by the heading slide, ejects the finished nail. A pinch device prevents the wire from slipping through the rolls during the forward movement of the feeder carriage. As the wire is straightened by having the rolls passed back over it, perfectly straight, long nails can be produced which could not be made were the wire straightened by being only pulled through rolls. The nail-making machines of standard pattern are made in sizes taking from No. 22 to 000 gauge wire. The machines can make nails in lengths of from ¼ inch up to 12 inches long, completing a nail at each revolution and requiring from ½ to 10 H. P. to drive them. As high efficiency and low cost of maintenance are the principal considerations in any machine, it will be appreciated that machines of this class require the best material and mechanical skill obtainable in their construction.

After the nails are made they are placed in tumbling barrels and are thoroughly scoured; this process removing any fins or other irregularities. Some grades of nails are then annealed and re-scoured. If the nature of the nails requires it, they are galvanized, copper coated, etc. In order to insure a non-rusting nail some makers place them in a furnace with a mixture of resin and marioala gum, which forms a thin film of rust preventative over the nail.

The barb, which is the roughened portion below the head, is put on in various ways. In the cheaper nail it is rolled on the wire before going to the nail machine and in others it is placed on the nail by the gripping dies. One manufacturer has a patented process for forming this barb, which can readily be detected by comparison with other nails.

WIRELESS EQUIPMENT FOR THE U. S. VOLUNTEER LIFE SAVING CORPS

Following the example of the Riverside Station at West 99th street, the other Greater New York stations of the U. S. Volunteer Life Saving Corps are planning to install radio apparatus for inter-station communication, as well as for picking up wireless messages from small cruising power boats fitted with radio equipment. In each instance, as in that of the West 99th Street Station, the equipment will be installed by members of the corps that are experienced in wireless. Those specializing in the equipping and operating of the wireless apparatus will be considered members of the Volunteer Wireless Association of the U. S. Volunteer Life Saving Corps.

The station at West 99th street has on several occasions been used to good advantage. When war ships are anchored in the Hudson River the station is used frequently as a means of communication between the man o' war landing and the war vessels.

The Volunteer Life Saving Corps acts as the department of life saving for New York City. It has a membership of over 3,000 and has 40 houses and 50 life boats.

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WIRING A CALIFORNIA MISSION

A NOVEL situation developed recently in connection with the wiring of the San Luis Rey Mission near Oceanside, Cal. It was found necessary to bore through from five to seven feet of adobe wall in order to bring in the wires. This was accomplished by means of pipes with saw-like teeth cut in the ends. The hollow pipes served as a means to carry off the dust and fragments while the boring was going on. These pipe-drills were operated by hand and given a sort of churning motion,

AN OLD CALIFORNIAN MISSION

partly turning and partly ramming in and out. Considerable difficulty was experienced in putting the wires through the timbers also, which, in this instance, were great beams that the Indians had hauled from the mountains over forty miles away, and which were bound together with raw-hide thongs.

It is a hopeful sign of the times that, although some people are trying their best to keep all the old buildings of historic interest in the same unimproved condition that they found them, there is a little reason being used by a few people in these matters. There is more romance in Progress than in Retrogression and we are glad to see this picturesque and beautiful old Mission, built by the Indians' labor, sacked by the Mormons and rebuilt by the Franciscan Monks, adopt the modern system of lighting.—*Donald Shumway Rockwell.*

VOLTAGE REQUIRED TO PRODUCE SOUND IN RECEIVERS

It may be interesting to note that the voltage required to produce just audible sound in receivers at high frequencies is enormously lower than at low frequencies. The table appended was compiled from careful measurements made in the laboratory. The receivers used were a pair of standard 800-ohm receivers of a well-known make.

Cycles per second.	Voltage required to produce just audible sound.
60	0.000620
120	0.000290
180	0.000180
300	0.000060
400	0.000018
550	0.000008
650	0.000003
800	0.000001
1000	0.0000006

—*P. C. Wright.*

LONG DISTANCE RECEIVING WITH AUDION

In a recent letter received from Mr. B. N. Burglund, he states that with a wireless receiving set similar to that described by him in recent issues of *Modern Electrics,* he was able to copy "Press" from San Francisco at a distance of 3,800 miles. He states that he could have done even better but for the fact that one of the audion bulbs burned out the same night. Using a regular Marconi valve, the best distance covered was 1,600 miles.

Mr. Burglund also writes that he has recently discovered how to improve the operation of some audions. He states that by placing them in a strong magnetic field, so that the filaments are cutting the lines of force, he obtains much better results and is not troubled with the sticking or polarizing of the audion, which eventually takes place when used in the ordinary manner. In these experiments the magnets of a five-bar magneto (telephone type) were employed with good results.

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Wood Turning for the Beginner

A Description of Two Attractive and Easily Constructed Music Seats

By George F. Rhead.

THE two turned music seats shown in the illustrations, Figs. 1 and 2, will be found of serviceable form and sufficiently simple for even the beginner in wood turning to perform creditably, the first being perhaps the simpler. They should preferably be made of some

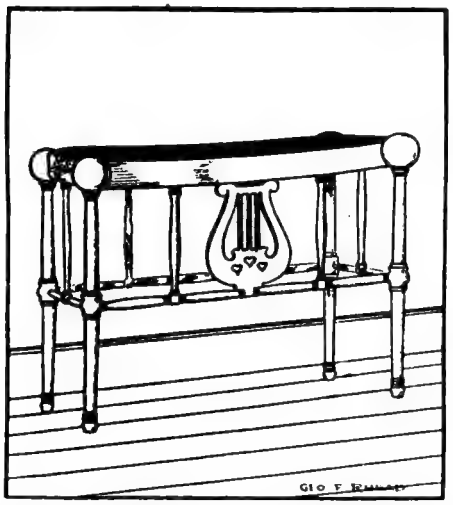

FIG. 1.—MUSIC SEAT IN TURNED MAHOGANY

fancy wood, such as walnut or mahogany, and finished to the highest state. For the beginner, white wood is probably the most suitable, since it is far less expensive than walnut or mahogany, and should a few pieces be wasted the expense will not be very great.

As the seat shown in the illustration, Fig. 1, is the simplest, it will be described first. The side and half front elevations, with measurements, are shown in Fig. 3, but before beginning any piece of work in wood turning it is advisable to make a full-size working drawing. From that the worker can cut out a cardboard templet or profile which will be found invaluable in ascertaining the progress of the turning.

The circular top into which the rails of the seat are tenoned may be turned separately and dowelled to the legs; by this means, a saving in material and labor will be effected and as the weight of the seat falls, to some extent, upon the vertical rails, this procedure may be considered a thoroughly practical one. The following is a list of pieces required for the turned work, with their respective dimensions:

For the legs, four pieces 1 ft. 5 ins. by 1¾ ins. square. A piece 13 ins. long, by 3½ ins. square from which the knobs may be turned. Six vertical rails 8½ ins. long, by 1 in. square; and two horizontal pieces 9 ins. by 1 in. These include all the parts that require turning, and the sizes specified are all slightly larger than the finished work, and include the portions for jointing. The beginner must remember also that in measuring timber for turned work, it is imperative to allow an extra half-inch at the ends where the turning is carried to the extremities, to avoid running the tools against the lathe centres.

FIG. 2.—FANCY TURNED WOOD SEAT

The unturned parts consist of the rails of the front and back and the sides, there being required for these, two pieces 8½ ins. by 4½ ins. and two 1 ft. 10 ins. by 4 ins. all 1 in. in thickness. The harp in the centre of the front, is sawed out from

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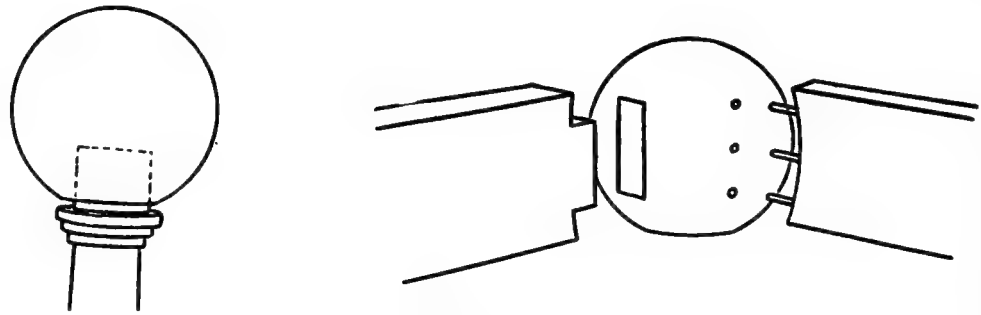


FIGS. 5 AND 6

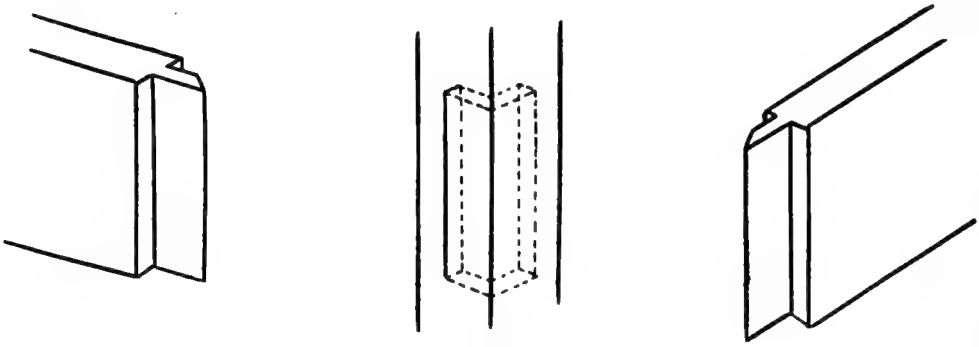


FIG. 7

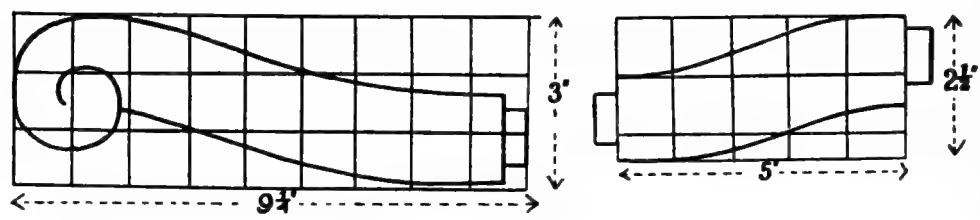
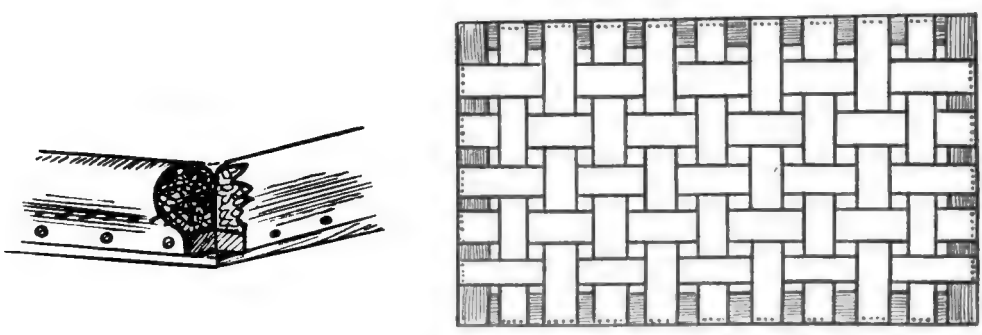


FIG. 8



FIGS. 9 AND 10

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a board measuring 6 ins. by 8 ins. by ¾ in.

It is almost superfluous to remark that wood for turning should be dry, and perfectly free from cracks, as well as free to a considerable extent from knots. The four legs, comprising that part of the work first put in hand, should be quite alike and uniform, although the turner need not keep exactly to the pattern shown but can vary it to suit his taste or requirements. For duplicating work a

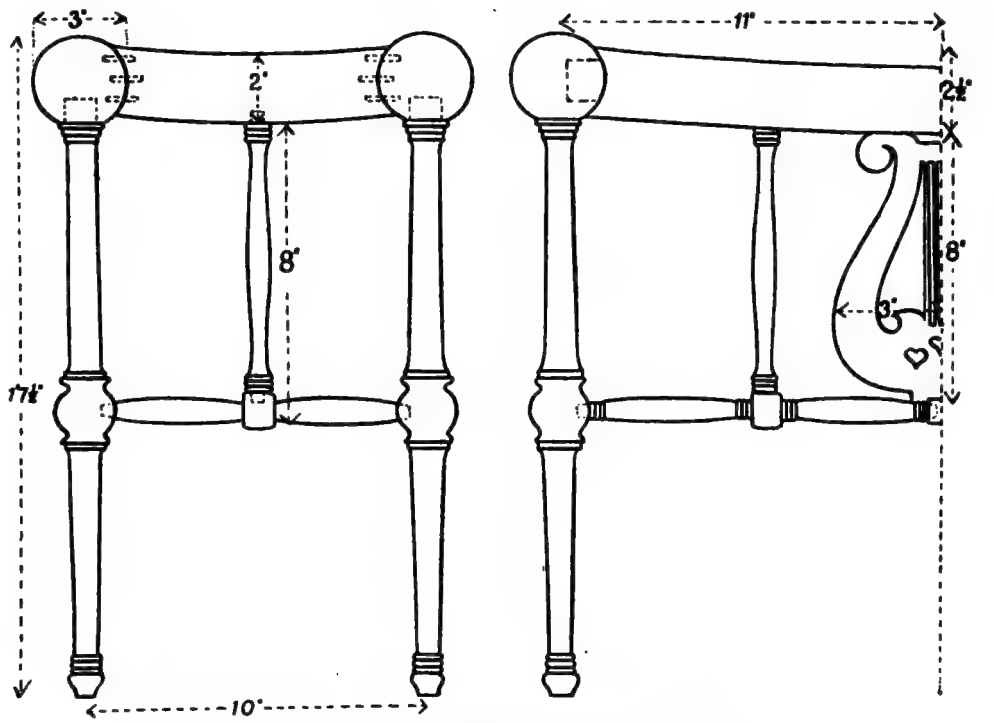

FIG. 3.—FRONT AND SIDE ELEVATIONS OF SIMPLE MUSIC SEAT

practical turner relies very largely upon the eye alone, but the beginner had better rely upon his rule and calipers, or make a cardboard templet from his working drawing to guide him.

Success in turned work, of which the proportions are satisfactory, depends mainly upon clean cut mouldings and well defined edges and angles, and in these matters, the beginner should exert his special efforts.

When the required size and shape have been given to the article, the surface may be cleaned up with a sheet of glass-paper held against the work as it revolves; it is by far the best to do this in the lathe than by hand for very often good work is marred by a too liberal application in one particular place.

Fig. 5 shows the method of jointing the knobs to the legs, a good fit being secured with glue. In Fig. 6 is shown the joint of the rails with the legs; those in front and back are mortised, but the short ones on the sides are only dowelled in position so as to avoid cutting the tenons of the long rails and thus weakening the joint considerably. The turned rails are all jointed by the same method, a ½ in. turned projection being formed at the end like a protruding dowel, and sunk into holes drilled to fit. Before securing the curved rails of the top, cut a "rabbet" all around for receiving the seat frame.

The half front and side elevations, with measurements for the seat shown in Fig. 2, are given in Fig. 4. In this design, the turnings are also of a very simple description and the same method of jointing together is used, with the exception of the jointing of the rails with the legs, a mitred tenon joint being the most

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suitable for this purpose. This is shown in Fig. 7.

The pattern for the curved pieces of the sides and those at the back marked A and B in the elevation, are shown in Fig. 8, squared up and ready for enlarging into a full sized drawing. The small piece of spiral turning in the back could, should the worker be a novice in turning, be replaced by a piece easier to make, rails. In the case of the design shown in Fig. 1, the top edges of the long sides require to be curved to conform with the curved rails. Screw a cross piece or two, if necessary to strengthen the frame, and then screw all around the edges of the frame an outer frame of ¾ by 1 in. strip, covered with canvas and padded with flock and stitched as shown in Fig. 9. Then tight-

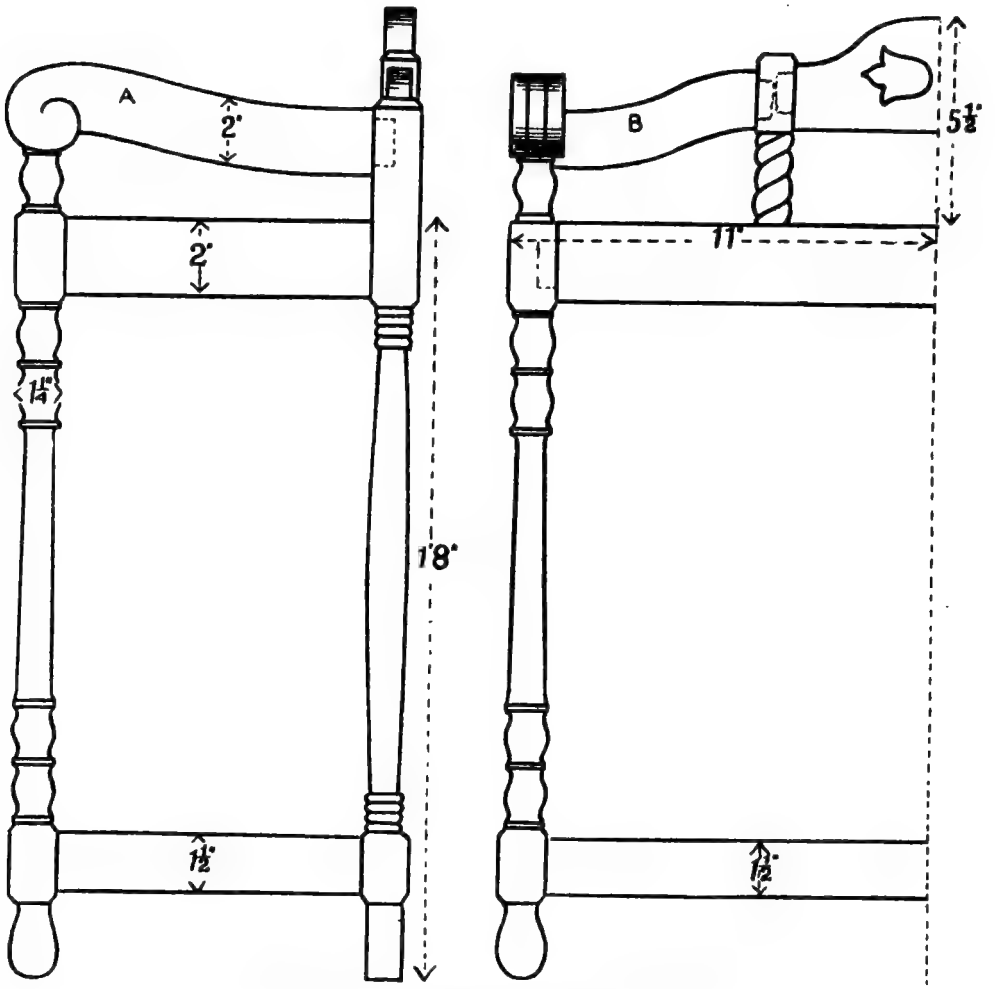

FIG. 4.—FRONT AND SIDE ELEVATIONS OF TURNED MAHOGANY SEAT

but still in keeping with the rest of the design. In fitting together, 1 in. square strips are screwed around the rails to support the seat frame. These can be made from white wood or pine measuring 2 ins. wide by 1 in. thick. The size of the frame should be 1 in. less all around than the inner measurements of

ly stretch webbing across the inner frame at the top, interlacing the strips as indicated in Fig. 10. This material, about 2 ins. wide, supports the stuffing and must be tightly pulled so as to prevent sagging, as far as possible, after a little use, which would cause the seat to look loose. Cover the webbing with canvas and pre-

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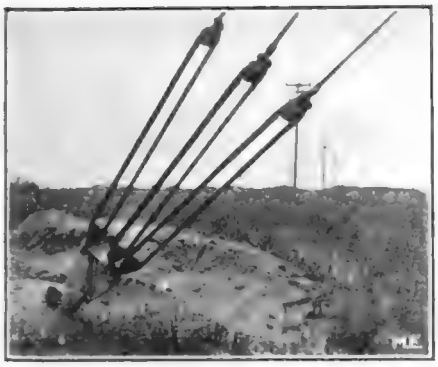
pare the stuffing, which should be of horse-hair well teased out, so as to retain its spring. The hair is covered with strong canvas, tacked to the edges of the frame, over which is applied a layer of wadding, when the seat is ready for covering with the final material. The final cover material is secured by means of gimp pins and is tightly stretched during the operation. The seat should fit the framing formed by the rails and be tightly supported by the internal rabbet or fillets.

A METHOD OF HOLDING GUY WIRES

In the accompanying illustration is shown the method of holding the guy wires for the aerial mast of the Naval Wireless Station at San Diego, Cal. The guy wires are anchored in concrete.



UNIQUE ANCHORING OF GUY ROPES

The ropes, that are held between the three sets of pulleys, are thoroughly tarred to keep the weather from rotting or shrinking them.—*Stanley E. Hyde.*

A PROPOSED NATIONAL ASSOCIATION

A plan is at present being considered for the purpose of establishing a national organization. All wireless clubs and associations are requested to send any suggestions or opinions they may have on the subject to Mr. George Eltz, 441 West 47th street, New York City, at the earliest possible date.

A GERMAN SUBMARINE SLEDGE

One of the accompanying illustrations shows a unique German submarine sledge as designed and constructed at Lübeck, Germany, as well as the Draeger oxygen diving apparatus for the diver. The other illustration shows this equipment being towed in the Ostsee, Germany; the submarine sledge being about to be submerged to the bottom where the diver can begin his work. The sledge is equipped with air tanks and connected by a long hose with the diver's helmet.

SUBMARINE SLEDGE ABOUT TO BE SUBMERGED

This submarine diving apparatus is suitable for operating at a depth of 40 meters (or approximately 130 feet) and the diver can work two hours without inconvenience as has been repeatedly done under the Baltic Sea. The submarine sledge has two rudders at the rear which allow it to be steered to the right or left, as well as a pair of deflectors in front which allow it to be submerged or brought to the surface at the will of the diver.—*Frank C. Perkins.*

SUBMARINE SLEDGE AND DIVER

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Electrically-Operated Photographic Machine

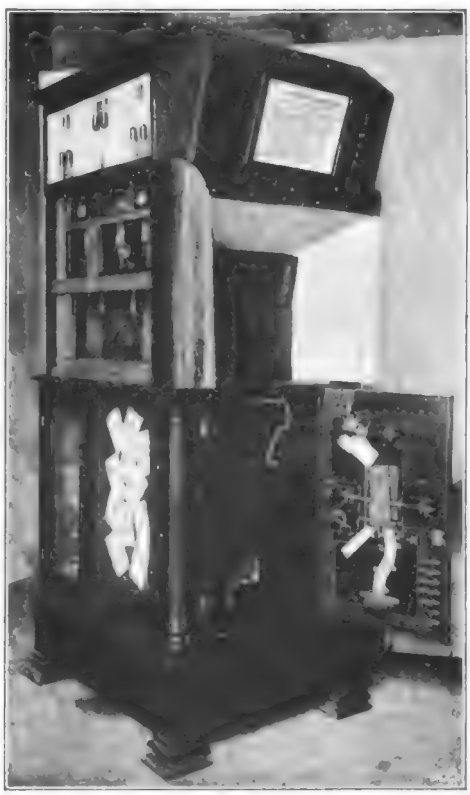
ONE is completely astonished in the marvellous work of the Ashton-Wolff automatic photographing machine, which produces attractive white and black portraits on platinum-bromide postal cards in the space of 4½ minutes.

ELECTRICALLY-OPERATED PHOTOGRAPH MACHINE

This machine has just been completed by its inventor at Paris where it has been placed in operation for public approval.

The person desiring to be photographed inserts a coin into a slot, whereupon a bell rings and a luminous sign fixes his attention for a pose. A strong flash from an electric light then illuminates the person for the purpose of securing an instantaneous view. The card which is developed afterwards as a positive is then put through the developing, fixing and washing processes in a single vessel by the use of ingenious magnetic valves. Electricity operates the entire machine and every function is automatically controlled. Similar valves serve to empty the tank, and when the card is finished, the bottom of the vessel opens and drops the card into a rotary dryer operated by an electric motor, so as to dry it in 15 seconds without the use of heat which would be likely to soften the gelatine. Electro-magnets are brought into play to arrest the motion of the dryer, and as soon as it comes to a stop, it is pulled into a vertical position and the photograph drops out and is delivered through a slot.

One of the most interesting features of this machine is the rotary electric contact maker which gives one revolution of an arm around a disk in order to send the current into all the various magnetic devices, motors, or lamps in the proper order and for the correct length of time. Care has even been exercised for adjusting the movement of the magnetic valves for summer or winter use,



PARTLY EXPOSED VIEW OF MACHINE

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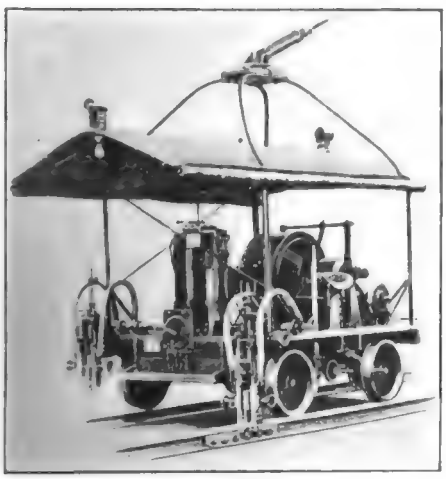
for the photographic baths act more slowly in cold weather. All the inside parts of the machine are built so that should a leak occur the chemicals cannot reach any part of the apparatus, but are forced to flow into a protective ebonite tank, and from that to a waste tank.

The entire invention indicates that every point has been carefully considered, and the machine is practical and reliable. It turns out one hundred postal cards without needing the least supervision or recharging, and the chemical solutions will last for one month before requiring renewal.—*Our Paris Correspondent.*

INCREASING THE ELECTRICAL CONDUCTIVITY OF A STREET CAR TRACK

ONE of the greatest losses with which the modern electric traction company must cope is that which occurs in the return of the current through the



ELECTRIC TRACK WELDING CAR

track to the power house. From a layman's point of view it would seem that the large rails used, joined as they are at abutting ends by thick iron plates and heavy bolts, would conduct the electricity back to the generators with perfect ease. But such is not the case.

A mechanically perfect joint is not necessarily electrically perfect and by exhaustive tests extending over a period of years, authorities in this field have conclusively shown that serious losses do occur between abutting rail ends and that, especially in the case of long interurban lines, the matter of "return circuit loss," as it is called, is a prominent item in the running cost of an electric railway system.

The most efficient plan advanced thus far in the way of making an electrically perfect joint between the rails, is the electric welding method. Simply explained, the operation consists in clamping an attenuated "V" shaped, copper bar alongside the rail and applying a gradually increasing current to the extreme ends. After a few seconds have elapsed, the points at which the electricity is concentrated, heat to a cherry-red and a rigid connection with the iron is effected.

An interesting point to mention in passing, is the fact that this connection is approximately four times as efficient electrically as a similar job accomplished by soldering. One hundred bonds a day by the electric method is the average work done by the welding car shown in the accompanying photograph.

THE BIRMINGHAM RADIO ASSOCIATION

The Birmingham Radio Association was recently formed, the object of the association being to promote sociability among the local amateurs, and to further the knowledge of and interest in wireless telegraphy.

The requirements for membership are the ownership of a working station and the ability to send and receive messages.

The association at present is contemplating placing in the Public Library several good reference books on wireless in order to get more young men interested in the game. Address either H. L. Anslet, president, 1428 Fountain avenue, or Gilbert Budwig, secretary, 1404 South 17th avenue, Birmingham, Ala.

BACK BAY WIRELESS CLUB

As secretary of the former Back Bay Wireless Club, of Boston, I have been instructed to tell you that our club has been disbanded. Most of its members have joined the Amateur Wireless Association of New England.—*A. L. Francis.*

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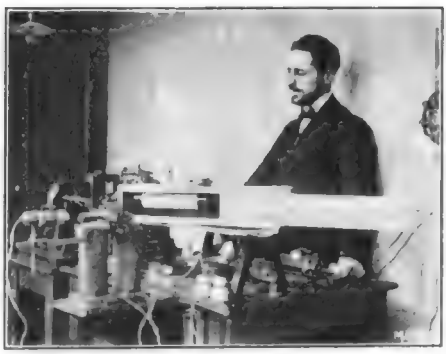
The Transmission of Photographs Over Wires

WHILE the transmission of photographs over wires cannot be called a new feat as it has been accomplished since a number of years, it is only within the last few months that successful results are being obtained and such a system is actually used in commercial work. Dr. Korn, a native of Munich, but at present a resident of

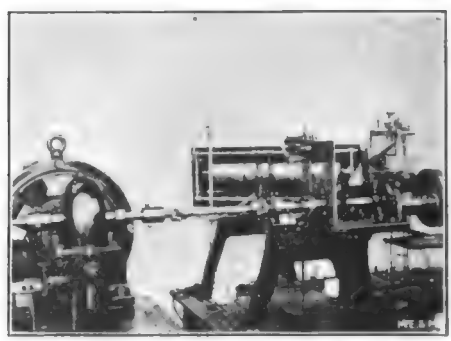


RECEIVING APPARATUS SHOWING EXPOSED PHOTOGRAPHIC DRUM

Paris, has devoted his entire attention to the perfecting of apparatus for photographic transmission over wires and his latest type of instrument bids fair to become of world-wide commercial importance. Even at the present time, the service is in operation between Paris, Berlin, London and Monaco, with prospects of immediate extension to other important cities on the Continent. During the recent hydro-aeroplane meet at Monte Carlo, photographs taken in the morning and afternoon of the important events were developed in the evening, transmitted over 550 miles of wire to Paris, and published in the leading Parisian newspapers the next morning!

The first practical system used in the laboratory of Dr. Korn a few years ago employed a positive film through which a narrow beam of light was passed. The dark and light portions of the film caused the beam of light to have a corresponding variation in intensity, effecting the conductivity of a selenium cell. Selenium is a metal which possesses the peculiar characteristic of changing its conductivity to electrical current according to the light falling on it. Thus, by the varying beam of light passing through the film, the electrical current that passed over the wires was caused to fluctuate. At the receiving end of the circuit, a special galvanometer was employed to swing in a beam of light, and by the variations in the current from the transmitter, the beam of light was caused to throw more or less light on a sensitive film wound around a drum. Both the transmitting as well as the receiving drums were turned at the same speed by synchronous motors, so that the receiving and transmitting apparatus would be in perfect unison, and the received photograph would be exact in detail to that of the transmitted one.

In the more recent apparatus employed by Dr. Korn in his latest experiments, the selenium cells have been dispensed with, as well as the positive film, which marks an important advancement in the perfecting of the system. The selenium and film offered many difficulties which would undoubtedly have handicapped the system from becoming of



TRANSMITTING APPARATUS SHOWING CONTACT-MAKING DEVICE

commercial use, and caused it to be strictly limited to the laboratory. With the present apparatus, a photograph is taken with any camera desired and the negative is printed on a copper plate, by the same process as the manufacturing of half-tone cuts for printing purposes. The film or plate negative is also placed next to a glass plate with lines across it, so that the finished copper plate will have parallel lines across its face as shown in one of the accompanying il-

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lustrations. The copper plate employed is about 1/132nd of an inch thick and when completed is held tightly on a wooden drum. A close examination of the copper plate shows that the photographic image thereon consists of high

A COPPER PLATE FOR TRANSMITTING

and low portions of copper with the little fine grooves of the lines across them. The drum on which the copper plate is attached is driven by a synchronous motor as well as that on the receiving drum, while a very finely adjusted contact needle regulates the flow of current between the copper plate and itself. Thus, the high and low portions of the copper plate as well as the ridges cause the current transmitted over the lines to be broken up and varied in accordance with the dark and light portions of the photographic impression on the sending copper plate. Where the ribs on the copper plate have been left high, the contact is made, whereas the contact is not made where the ridges have been lowered. The receiving apparatus in the present system varies but little from the former system, that has already been explained above. A galvanometer actuates a shutter interposed in a beam of light which passes on to a sensitive film. The receiving and sending drums are thus caused to transmit and reproduce the image desired, the photograph that is received appearing in straight white streaks as shown in several of the accompanying illustrations. The illustrations of the received photographs, serve to show the excellent detail in the received impressions, and it may be noticed that features of persons, parts of machines, scenes, and other details are reproduced sufficiently to identify them. For the most part, the illustrations of received photographs in this article have been transmitted through considerably more than 550 miles of wire, between Monte Carlo and Paris.

While apparatus has been installed in London for the purpose of transmitting views to Paris, the tests have not proven entirely satisfactory, owing to the large inductance of the cables, passing under the English Channel. However, between Berlin and Paris the results have been entirely successful, and even from Monte Carlo to Berlin via Paris, though this presented rather a difficult feat. The difficulty in long distance operation lies in the fact that the copper ribbed sheet of the transmitter containing the photographic impression must carry a heavier current to cover the greater

PHOTOGRAPH MADE WITH RECEIVING APPARATUS

distances, and this gives rise to heavy sparking between the copper plate and the needle, which limits the distance that can be covered. However, this may be obviated by a relay arrangement which will cause the copper plate to carry only a small current sufficient to

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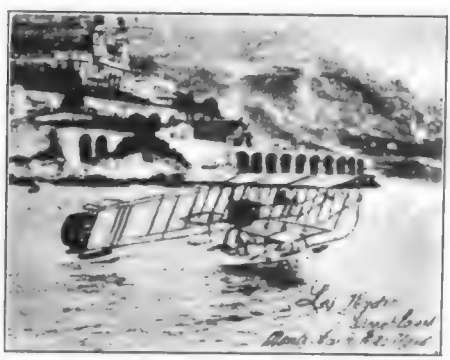
operate the relay, which in turn will regulate the heavy current sent over the wires.

The accompanying illustration of the receiver shows the arrangement of the apparatus. The galvanometer employed is of the Einthoven form, and extremely sensitive to minute changes in line current. A cylinder like that of the transmitter is mounted in a dark box which is light-proof. A pin hole admits the light from a Nernst lamp, seen at the left of the photograph. The beam of light from the Nernst lamp is interrupted by the galvanometer shutter in front of it. The beam of light going through the shutter when it is opened, falls on the film encased in the long metal case. The large electro-magnet is the source of a powerful magnetic field, in which is stretched a fine metal strip carrying the



A HYDRO-AEROPLANE PHOTOGRAPH TRANSMITTED OVER 550 MILES

line current, this being the galvanometer. Upon the passing of a current from the transmitter, the strip is deflected, and by so doing it uncovers the beam of light from the Nernst lamp, allowing it to strike the film. Thus, contact, no contact, contact, etc., as made by the needle of the transmitter on the copper plate causes light, no light, light, etc., to strike on the receiving films, with the resulting white lines and image. The operation of sending a photograph over the wires of this system is a matter of but a few minutes.

While it cannot be said that the system of Dr. Korn is a commercial success, and that it will, in its present form, become as widely employed as the telegraph or telephone, it may be admitted that the present system gives rise to the belief that within the very near future such apparatus will be in use over the entire world in connection with press reporting. With the many improvements that will no doubt be made to perfect the system, we may look forward to the advent of the apparatus in every day use, as in the instance of the telephone. The combined telephone and "telephot" or photograph transmitter has long been the dream of inventors and imaginative writers, and there probably remains but little time before this ideal invention will become a reality.—*Our Paris Correspondent.*

THE RADIO CLUB OF AMERICA

The Radio Club, of America, just completing the fifth year of its existence, wishes to announce to all who are practically interested in the science of radio communication, and whose researches have been retarded by lack of acquaintance with others similarly interested, that here is an organization whose object is to bring such men together.

As the Junior Wireless Club, Ltd., it was among the first organizations to take a definite stand in the defense of the amateur against unsatisfactory legislation, sending a delegation to Washington in 1910.

Although the club was at first purely composed of amateurs, membership has in recent years been greatly increased by a score of professional operators, university graduates, and business men, interested in wireless. The club has as a consulting engineer, Prof. R. A. Fessenden. Several of the members have made inventions of no small note.

Meetings are held monthly, and an interesting program always is prepared for the occasion.

Applicants for membership are passed upon by a committee, and the name is then submitted for the approval of the club members. The secretary, George Burghard, 1 East 93d street, New York, will be pleased to answer any inquiries.

KNEW WHERE HE WAS

A little four-year-old was in an upper berth in a sleeping car. Waking in the night, he was asked if he knew where he was.

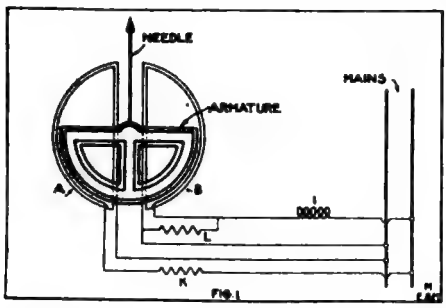
"Tourse I do?" was the answer. "I'm in the top drawer."

Google

The Seibt Direct Reading Wave Meter

By Henry Townsend, Jr.

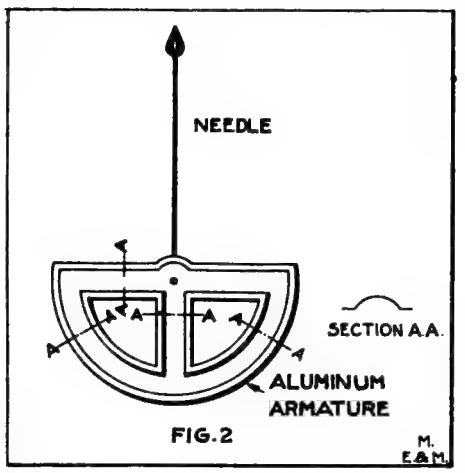
FOR most all ordinary electrical and allied measurements of a quantitative form there is accessible to the engineer some type of direct indicating meter. Up to the present time, however, the radio engineer has had no form of direct indicating instrument for the measurement of wave length. But today, owing to the ingenuity and perseverance of Dr. George Seibt of Germany, an instrument that indicates wave length directly when properly connected in an



oscillating circuit, has been finally developed. This device is covered in part by Dr. Seibt's French patent No. 446,251 and English patent No. 16,874.

This instrument relies for its operation upon the fact that if a conducting ring is placed in front of a coil in which an alternating current flows, the ring will be repelled from the coil. This action is due to the interaction of the current induced in the ring by the alternating magnetic field in which it is placed, and the magnetic field itself. The action so produced is known as the Thomson or dynamometer effect. Thomson's repulsion effect under the above conditions has been utilized by Mandelstam and Papalexi in a special form of double, alternating current mirror galvanometer whereby the radio frequencies can be very precisely measured. Their apparatus is only of a laboratory character, however, and it remained for Dr. Seibt to produce a really serviceable and practical instrument for the direct indication of wave length, by means of a needle moving over a graduated scale. His perfected wave meter is thoroughly portable and has been used in an aeroplane radio set, where the vibration was extremely violent.*

To give the instrument as long a scale as possible and to properly split the phases of the two stator coils A and B, Fig. 1, the arrangement shown is used. An inductance coil is indicated at I, while K and L are resistances. By this means and also the special construction of the armature, seen at Fig. 2, a long and evenly divided scale is possible. The armature is composed of thin sheet aluminum, about 0.15 millimeter thick. The weight of the armature must be kept very light and jewel bearings are employed. The two fixed coils A and B, are preferably made of "litzendraht,"—special multiple stranded conductor for radio frequency instruments. Their diameter is about 2 inches. These fixed stator coils are semi-circular in form and have been placed as at Fig. 3, to give the longest scale deflection. This is because the equilibrium is dependent upon the electromotive forces induced in



the armature by the two coils being equal and opposite, and therefore the angle of rotation will be greater, when the field intensity of the coil toward which the armature moves is larger at the entering edge than when it is constant. The inclined coils, therefore, produce a great-

* See the Proceedings of the Institute of Radio Engineers, Vol. I, Part 3.

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er variation in the deflection angle for a definite change in frequency than strictly parallel stator coils. It should be remarked here that the moving armature disc is surrounded by 4 stator coils; one pair being in back of it and the other in front of it. The lower semi-circular coil and the one immediately above it are joined in parallel and not in series. This reduces the reactance of the instrument and makes its connection to external circuits much simpler.

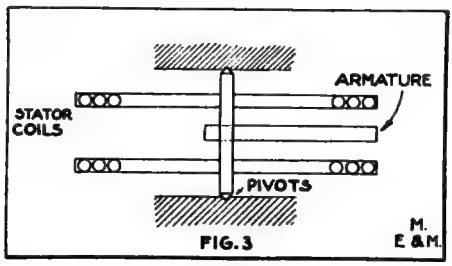

FIG. 3

The Seibt direct indicating wave meter is connected directly in the grounded side of the antenna or other circuit in which high potential differences exist, through the medium of a close or loose coupled air transformer. A common connection of the wave meter is seen in Fig. 4. The usual auto-transformer supplied with the instrument is composed of copper strip and has a slider fitted to it by which means any desired current can be passed through the wave meter.

The portable model of this instrument resembles any ordinary portable voltmeter, fitted with a wooden case and folding half door. It is calibrated with two scales, one reading from 150 to 1500 meters, and the other from 500 to 3000 meters. The scale divisions for the 1500 meter range each correspond to 10 meters and for the 3000 meter range each scale division is equal to 100 meters. As may be surmised, a certain amount of current is passed through the instrument, and for indicating the allowable minimum and maximum currents passing through the wave meter a small lamp is fitted to it just above the scale. The auto-transformer is adjusted until the tube or lamp shows a red glow, indicating minimum current for a correct reading and a bright glow for the maximum current for a correct reading. Change in wave length is effected by means of a switch on the instrument, which short-circuits part of the resistance coil in series with one of the stator coils.

The energy consumed by the portable form of Seibt wave meter on the 3000 meter scale is about 1 watt, and on the shorter or 1500 meter scale about 4 watts. The needle of the instrument does not have any definite zero current position of its own, but comes to rest at various points along the scale. When measuring a wave length the needle takes up its proper position along the scale. Current transformers are supplied for this instrument enabling it to be used on radio transmitting sets as large as 50 or more kilowatts, with antenna currents up to 100 amperes.

Seibt's wave meter can be used constantly if desired and it has been connected in circuits for several hours without noting any changes in its reading as regards accuracy. The instrument weighs about 5 pounds and measures 9 by 8 by 3⅝ inches. Its readings are practically independent of the damping or radiation resistance of the antenna circuit. The price of this wave meter is about $40 in Germany, or $58.00 including duty in the United States. This meter is certainly in great demand for the rapidly growing wants of the radio man, and should have a very fine market indeed.

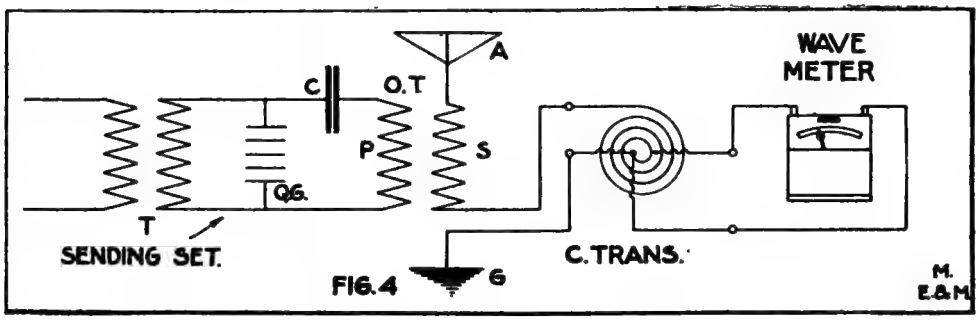

FIG. 4

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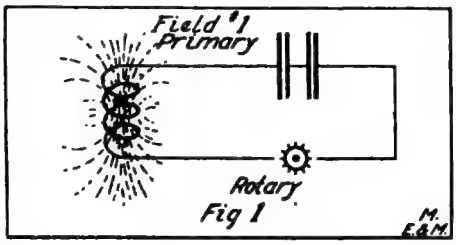
An Improved Oscillation Transformer

By B. N. Burglund

MUCH has been written upon the various instruments used in wireless telegraphy and telephony, but none has been more neglected than the oscillation transformer.

I have noticed but a few feeble attempts, and these strictly along orthodox lines. When we stop to consider the dis-



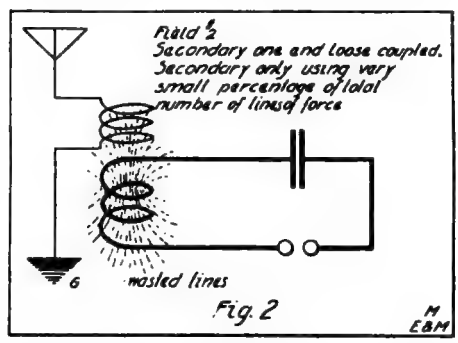
tance covered by our modern wireless equipments and then, with the engineer's eye, examine some of the apparatus, we begin to wonder how we ever can transmit energy at all.

Our mathematicians have shown us how to construct transformers that work with an efficiency of 98.6 per cent. on low frequency alternating current, but on high frequency currents, we have up-to-date transformers with an efficiency, when at their very best, of only 20 to 30 per cent.; and in connection with ordinary rotary and stationary spark gaps (the quench type not included) this efficiency drops as low as 15 per cent.

Dr. A. Hoyt Taylor of the University of North Dakota has expressed a term which applies well to wireless transmission of energy. I will try to express Dr. Taylor's view in as simple a language as possible, using as an example a large bell suspended so as to vibrate freely at its own natural period of vibration. For instance, strike the bell with a large hammer one sharp blow and the bell will ring or vibrate very loud and clear. All the energy stored in that blow was transmitted into the bell and expended again in the form of vibration in the metal which is then transformed into sound waves; the bell will ring for a certain time or until the energy is all dissipated. This, Dr. Taylor calls "Impact Excitation."

Now on the other hand, strike the bell with a sack of meal and even though double the energy is used in the blow, no sound is emitted because whatever energy was transmitted to the bell has been immediately re-absorbed by the meal sack.

Now—applying this same principle to the transmission of wireless energy into the aerial—if it were possible to have the spark gap or its substitute impart the stored energy of the condenser to the aerial and then allow the aerial to oscillate at its own natural period, we would be considerably nearer the ideal conditions of wireless transmission of energy. We would not need any helix or oscillation transformer and tuning would be simplified, because the wave transmitters would depend entirely upon the natural period of the aerial. The efficiency would be very high, since all of the energy stored in the condenser would be transmitted directly to the aerial without any loss. The quenched type of spark gap comes as near as is practicable in gaps where air is used as a means of producing the disruptive discharge. But even this type of spark gap is far from ideal; an oscillation transformer must be used even though the distance between the primary and secondary is adjusted as



close as insulation will allow. We still have a loss of at least 30 per cent. of the condenser energy, due to the fact that air is used as a magnetic path.

Nearly all styles of oscillation transformers that are in commercial use, especially those used with stationary and rotary gaps, are so constructed that at least 50 per cent. of the applied energy

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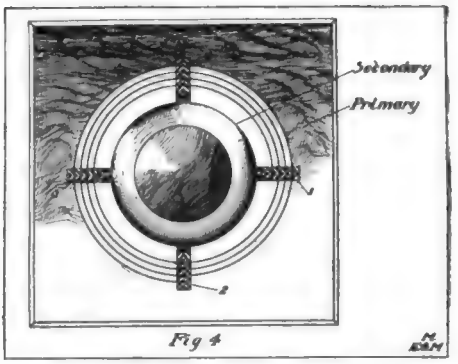
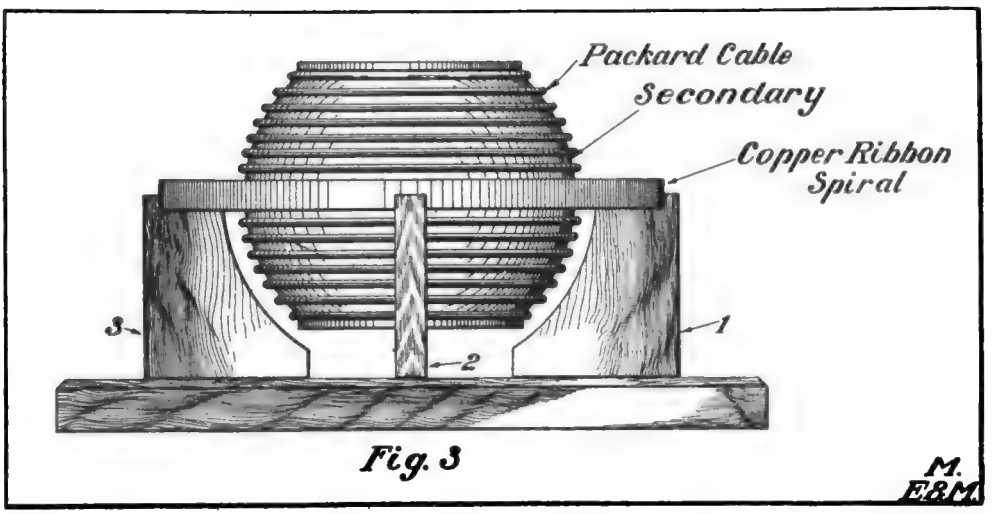
is lost, owing to the necessity of extreme loose coupling. Nearly all types of transformers have their secondary adjusted in such a position that they only utilize one-half of the magnetic lines of force generated by the primary. By exploring with a fixed coil or wave meter, a fairly accurate chart can be made showing the position of the magnetic field.

Fig. 1 shows a magnetic field as found by the exploration of a helix 18 inches in diameter and containing 3 turns of inductance. Fig. 2 shows the general accepted idea of loose coupling the primary and secondary and utilizing only a very small per cent. of the energy in the primary. An oscillation transformer where the secondary cuts all of the lines of force generated by the primary, is an ideal type of design. Fig. 3 shows a theoretical design of this type. As will be noticed, all of the magnetic lines of force are utilized, that is, all of the magnetic lines contained within the primary. Of course, it is understood that it is impossible to utilize those lines of force that pass through the air outside and that are



and that the variation of coupling is accomplished by tilting the secondary, so that the secondary winding cuts less and less lines of force until the two windings are 90 degrees apart in which position the secondary does not cut any lines at all. It will be noticed that the secondary is in the center of the magnetic field, regardless of the degree of coupling. It will also be observed that the two circuits are not wound parallel to one another; the primary is wound in



known as the "return lines of force." With a closed coil type of transformer these so-called return lines of force are all utilized, but in the open coil type it is not practicable to utilize these lines; so with the type of transformer described herein the writer will deal only with the lines of force which are contained within the helix or primary proper.

In the accompanying drawings it will be seen at a glance that all of the lines generated by the primary are utilized the form of a large clock spring and the secondary is wound on the surface of a keg or barrel. Here, again, we have the two windings at 90 degrees to each other, but the lines of force generated in each coil are in the same direction, providing the two windings are so wound that their magnetic poles are the same.

The author has found by practical experimenting and testing that if the pri-

(*Continued on page* 88)

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The New Compressed Air Gap

A DESCRIPTION of the principles and construction of the compressed air spark gap recently introduced may be of interest to our readers. A few words on the functions of the spark gap and the operation of other inventions that have been designed to obviate the difficulties involved in its use will aid in an understanding of the new one which is the subject of this article.

As every reader knows, an ordinary transmitter consists of a high tension transformer attached to the terminals of a condenser, around which are connected a spark gap and inductance. The transformer serves simply as a source of energy from which the condenser is charged, the condenser in turn discharging through the gap. This discharge usually takes place just twice in each cycle of the alternating current, which operates the transformer, that is, at the two points of maximum potential occurring in each complete alternation. The portion of the transmitter which includes the condenser, spark gap and inductance, constitutes what is known as the closed oscillation circuit, the sole purpose of which is to start a train of oscillations in the aerial that is connected either directly or inductively to the inductance in the closed circuit. Once started, these oscillations in the aerial circuit will continue with much greater freedom if the spark across the gap is quickly suppressed, but under ordinary circumstances this discharge continues, with the result that a great deal of energy is, in various ways, wasted. Apparatus for a simple experiment illustrating the interaction which occurs between the closed and aerial oscillation circuits, is shown in Fig. 1. To a string attached loosely between supports, tie two small weights of equal size, suspending them by means of additional strings as shown. Upon swinging one of these weights—which we will consider the closed oscillation circuit, it will be noted that its motion is gradually transferred to the second weight, which will, in a moment, swing with an amplitude almost equal to the original stroke of the first, which has in the meantime entirely lost its energy. If at this point we lift the first weight, the second one will continue swinging for a considerable period of time. The original pendulum has delivered up its energy and should be removed from any further relation with the second one if maximum efficiency is to be attained in the second pendulum, which corresponds to the aerial or open oscillation circuit. But in the analogy of the wireless transmitter, unfortunately such is not the case when an ordinary spark gap is employed. The action which thus takes place is illustrated by leaving the first pendulum undisturbed instead of eliminating it, as was done in the first experiment. The result will be a very large decrease in the duration of the oscillations, which, instead of being permitted to go on undisturbed in the second pendulum, or aerial circuit, which is the useful one, are transferred back and forth from one to the other. This action serves no purpose and wastes a large part of the available energy, causing a rapid damping of the oscillations emitted by the aerial. It is just this damping which is aimed at in the section of the wireless law which specifies that the logarithmic decrement of stations shall not exceed 2/10. This is but the mathematical method of expressing damping or the rate at which oscillations in the aerial circuit die out. A second, and very important result of failing

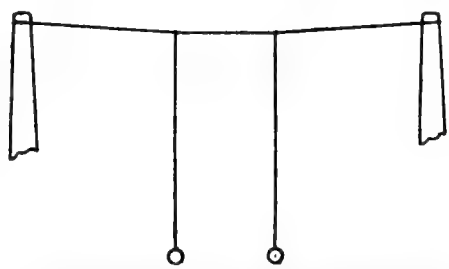

FIG. 1.—TWO PENDULUMS FOR SHOWING THE ACTION OF OSCILLATION AND AERIAL CIRCUITS

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to suppress the primary discharge as soon as it has served its useful purpose, is the drain upon the condenser which occurs when the spark gap continues in action. It is clear that if the spark continues any longer than necessary, the energy of the condenser is needlessly depleted, thus reducing the potential available for the next discharge. A third and almost equally bad result of this interaction between the two circuits, is the disturbance of the purity of the emitted wave. Strong secondary waves differing in length from the main one and consequently interfering and preventing sharp tuning at the receiving station result, thus not only making it difficult for the receiving operator to read the station through others, but causing needless interference with the work of nearby

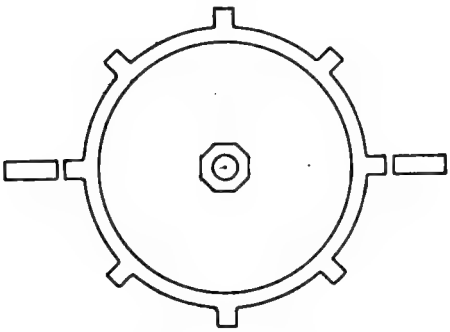

FIG. 2.—PRINCIPLE OF A ROTARY SPARK GAP

operators. A fourth difficulty arising out of the unnecessary persistance of the discharge in the closed circuit is the arcing and heating, as well as other troubles, arising within the gap itself.

The main object in all development of spark gaps is quick quenching of the discharge, the importance of which has just been dwelled upon at length. Gaps accomplishing this purpose are said to produce shock excitation; that is, the aerial is started in action by means of a shock delivered from the closed oscillation circuit. This term implies the absence of any interaction between the two and also that the closed circuit serves, as it should, simply the purpose of starting in motion the aerial oscillations. A means for accomplishing this result mechanically has been devised in the form of the rotary gap, the principle of which is illustrated in Fig. 2. With this gap the discharge can occur only when a pair of the rotating electrodes come opposite the stationary ones, being quickly broken off by the rotation of the motor. The number and size of the electrodes, and the speed of the motor, are so adjusted that a suitable spark frequency and duration of discharge are obtained. This method has been adopted with excellent results by the Marconi and National Electric Signalling companies, and also by a large number of amateurs. However, in the case of the amateur stations, the principal advantage has been the attainment of a high spark frequency often amounting to about 480 sparks per second, instead of only 120, as is produced by an ordinary gap, which generally discharges only twice in each cycle. The actual increase in the hot wire meter reading, which records the energy of the oscillations, is not likely to amount to more than 10 or 15 per cent.

Another method, which does not involve the use of a motor, is the quenched gap originated by German inventors and now used exclusively by the Telefunken company, and to some extent by Marconi. This type of gap is illustrated in its essential features in Fig. 3. The spark takes place in the spaces between the electrode plates, which are separated by gaskets of mica or some resilient material. These gaskets also serve to render airtight the spaces between the plates. A groove is provided between the sparking face and the gasket, in order to prevent the discharge from attacking the latter. Adjustment is usually accomplished by varying the number of gaps employed. Various theories have been put forth to explain the action of the quenched gap, but it would appear that the main essential is the exclusion of air, irrespective of the exact cause of the quenching. Excellent results have been attained with this type of gap in connection with modern 500-cycle commercial equipments, but for some unexplained reason, these results do not appear in the small 60-cycle sets of the experimental and private station. The quenched gap has unde-

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niably proven itself a failure, so far as the smaller outfits are concerned.

Thus, from one cause or another, the great advantages of the modern quenched discharge have been unavailable to the private station, owing to the failure of devices employed for this purpose in commercial work to produce similar results on the 60-cycle set. The solution of this problem of attaining the advantages of a quenched discharge for the small station was the object of a series of extended experiments carried on in a laboratory in Chicago for a period of over a year upon spark gap design. After many months of work upon this problem, it was discovered that the introduction of air under pressure within the gap produced most remarkable results. The hot wire meter swung up to nearly twice the value reached with an ordinary gap, as soon as the compressed air instrument was applied. It appeared that the increase of air pressure within the spark chamber was the only requirement to produce the long sought results for the 60-cycle set. But with the introduction of the air pressure, new difficulties arose. Insulation and

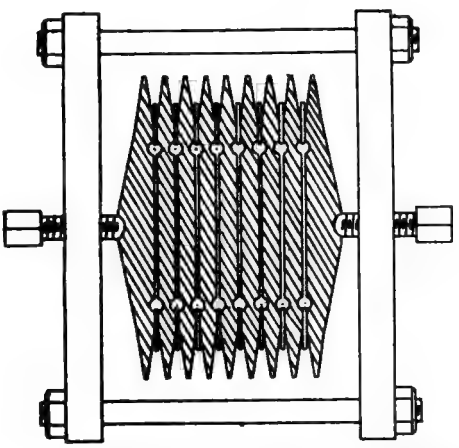

FIG. 3.—REPRESENTATIVE DESIGN OF A QUENCHED GAP

leakage troubles appeared and above all was the problem of designing a structure embodying the new principle, which would be at once efficient and trouble proof, and at the same time economical in design.

These difficulties were slowly overcome, until finally, one by one, the essential features were combined in an instrument of simple and strong construction.

In Fig. 4 is illustrated this new instrument. It consists essentially of four adjustable sparking spaces arranged within an air-tight chamber. This chamber is clamped within an insulated frame and is provided with a Schrader valve through which air is

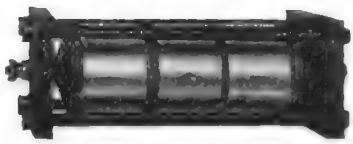

FIG. 4.—THE NEW COMPRESSED AIR SPARK GAP

forced by means of a bicycle pump. From 10 to 30 or 40 pounds pressure is employed. The electrode plates are punched and drawn with special tools from sheet copper and are spaced by means of gaskets cut from a very soft grade of rubber. Ordinary "rubber" contains only 10 or 15 per cent. of this very expensive crude material, the name of which it bears. But the conditions met with in the new gap necessitated the employment of a grade almost entirely pure. The thickness of these gaskets is specified as .096 of an inch and they do not vary from this more than .002 inch. The sparking surface of the electrode plates is about two inches in diameter. Each pair of electrodes is spaced from the next by means of a brass tube which serves to radiate heat and also forms a part of the air chamber. Two ribbed plates constitute the ends of this chamber and these are pivoted to the clamping frame. Considerable experimenting was required in order to find an applicable method of rendering the gaskets entirely air-tight, but a way of coating was finally arrived at which served this purpose. The insulation is of black vulcanized fiber, which was found to be the material that could best meet with the conditions involved. This fiber is finished by milling, grinding and polishing. The successful operation of the gap has necessitated unusual

(Continued on page 92)

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The Panama-Pacific Exposition and Patent Protection

By George William Miatt.

AN error of the fourth dimension is obvious in the Kahn law recently adopted primarily for the protection of foreign exhibitors at San Francisco in 1915. The framers of the bill in their anxiety to propitiate and protect foreign exhibitors have through ignorance of the premises unwittingly overreached their mark. If the text of the Act is to be construed literally it is unquestionably the most dangerous, ill-considered and inexcusable law which has ever been enacted in this country relating to patent, design, trade-mark and copyright property; and the Patent Law Association has very properly begun an active crusade for its repeal or modification, in order to avert the confusion and injustice that would inevitably result from its enforcement. Designed to protect the foreign exhibitor against piracy, this law permits the piracy of the inventions, designs, trade-marks and business of our citizens, protects the pirate and penalizes his victim. If allowed to stand in its present form it will materially injure instead of benefit the Exposition, since United States manufacturers will hesitate to send their goods for the inspection of "proprietors" of unknown foreign patents if they are thereby to subject themselves to the risk of suit for infringement without even a chance for defense.

There can be no objection to the provision of the first section of the act, that all articles imported for exhibition shall be admitted free. Section 2 provides for a branch Copyright and Patent Office at the Exposition, and permits the "proprietor" of any foreign patent, trademark, or copyright to obtain from said office a certificate amounting to legal evidence of such "proprietorship"; while Section 3, makes it unlawful to "copy, imitate, reproduce or republish" anything exhibited at the Exposition having the protection of a foreign patent, copyright, trade-mark, etc., without the authority of the "proprietor" thereof, whether he has a certificate from such branch Patent Office or not. Whether innocent or premeditated, infringement of such alien rights is punishable by (a) Injunction; (b) Damages and profits; (c) Surrender of alleged infringing articles to be held during suit; (d) Surrender of articles found to infringe, and all means of making them, all to be destroyed. Moreover, Section 4 makes *wilful* infringement a penal offense, punishable by *imprisonment* for a year or less, or a fine of $100 to $1,000, or both; a penalty far more severe than that for infringement of a regular United States patent, because of the inclusion of fine and imprisonment; while Section 6 gives protection to the "proprietor" from the time the protected article arrives at the Exposition grounds to the end of three years from the close of the Exposition, presumably December 4, 1915.

Hence it will be seen that this precocious law practically grants automatically an ultra unimpeachable United States Patent, Trade-Mark or Copyright, as the case may be, to every exhibitor who holds a foreign Patent, Trade-Mark, or Copyright, etc., from the moment his goods are received on the Exposition grounds until December 4, 1918 at least; and this extraordinary and gratuitous protection is granted without application, without the production of his foreign patent, trademark or copyright, without examination, without fee, without publication or notice of any kind to the public. He is not even required to obtain the certificate provided for by the act itself, although he "may" do so if he cares to take the trouble.

Was ever law more preposterous or more calculated to result in confusion worse confounded, particularly when taking into consideration the great diversities in Patent Law and Practice in various countries abroad as compared with our own. It proposes to grant protection to *inventions* possibly known here from time immemorial; on which our Patent Office may have refused protection, or granted patent protection still in force; or which have been dedi-

(*Continued on page* 115)

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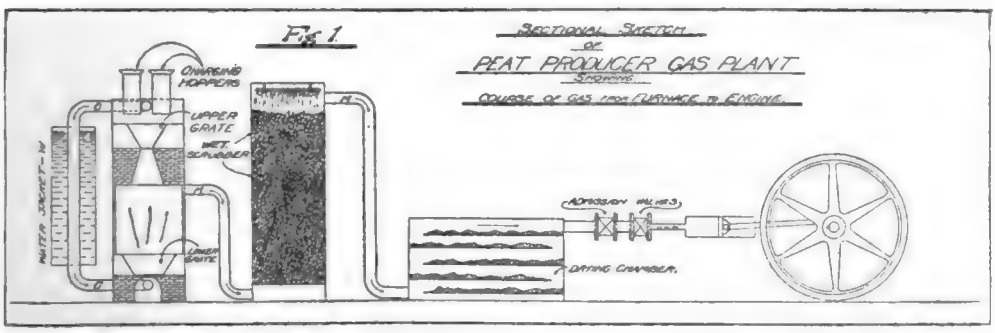
Modern Producer Gas Engines

A Recently Introduced Form of Prime Mover With a Very Promising Future

By Stephen House

IT is the conviction of many that the internal combustion engine has come not only to stay, but to finally supplant its steam predecessor as the chief mechanical agency of work. We are continually being reminded in these days that man's efforts ought to be, and must be at no very distant date, directed towards the conservation of those commodities necessary to modern life. Land now devoted to grain growing will, in a few years' time, fail to satisfy the requirements of mankind; a state of things which will be remedied only by intensive farming. Intensive farming depends for its successful operation upon an adequate supply of good fertilizer, and as the natural sources of this substance are fast nearing depletion, science must devise means of artificially preparing fertilizer if we are to be saved from rapid extinction. The seemingly exhaustless coal resources of the world will have their day and come to an end, by which time, if a substitute has failed to appear, we cannot help but miserably perish, unless such calamitous circumstances resulted in a general migration of animal life from the colder to the warmer zones of the earth. In the meantime, however, we can postpone as far as possible that direful day by utilizing our present supplies of fuel more and more economically.

Coal differs greatly in character and in its capacity as a heat producer. The lignites of the West are thermally less valuable than the anthracites of the East. Yet when it is considered that the average type of steam engine of from 200 to 300 horsepower delivers only about 5 per cent. of the available heat units in the form of effective work, it will be immediately appreciated that large quantities of fuel are required. Since the efficiency of the steam engine is so low it would appear, too, that so far as useful work performed is concerned, huge quantities of coal are annually wasted. The introduction of internal combustion has done much towards eliminating waste while it has simultaneously raised the efficiency. The internal combustion engine, like most other innovations, has had to fight its way to the front of practical utility from the time of its initiation, when the high cost of coal prohibited more than a small plant, to the present day, when, in the Diesel engine, it claims to possess the highest thermal efficiency of all mechanical engines, namely, 46 per cent. The increase of efficiency has been accompanied by increased economy in the internal combustible. It has progressed from expensive town gas to comparatively cheap crude oil ignited in the piston cylinder by the heat of high compression.



There is a system to which scant attention has been paid as yet, but which has at least the quality of cheapness as a recommendation. While the ordinary steam engine consumes about six pounds

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of coal per horsepower hour, the internal combustion engine, driven by producer gas, uses only about 1¼ pounds of peat fuel per horsepower hour. Plants driven by peat producer gas have been greatly improved upon during the past few years, and provide above all a means whereby the bogs found in this and other countries may be put into effectual service. The system is interesting and well worthy of a brief description. As distinguished from a steam plant a producer gas plant consists of a furnace, a wet coke scrubber, a drying chamber, and the engine proper. These principal parts have been shown without unnecessary details in the accompanying sketch. The furnace, itself, consists of two parts: an upper and a lower grate, which are connected by means of the pipe C. The functions of these two parts of the furnace are not identical in any way. In the lower is burned dry peat which has been broken into small pieces. As soon

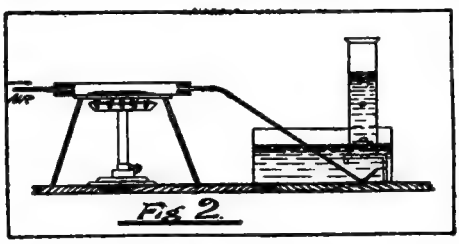

Fig. 2.

as this is burning well the upper grate is filled with peat in the rough. The heat in the lower part of the furnace acts as a fire to accomplish the dual purpose of drying the peat in the upper part and driving off the greater part of the volatile matter, mostly hydrocarbons. This mixture of gases travels by way of pipe C to the lower grate where it passes up through the slowly burning peat to the pipe M. These pipes unite into one and carry the gas to the wet coke scrubber. As the drawing illustrates, the scrubber is an iron receptacle nearly filled with coke through which continually percolates a stream of cold water. The gaseous products from the furnace enter the scrubber at the lower end, and in ascending through the coke suffer a continuous cooling effect which increases as the gases ascend. Cooling the gases causes a larger part of the impurities, such as tar, which has escaped condensation by the water jacket W, to condense on the coke and walls of the chamber. Accordingly, as the gas passes to the drying chamber it is comparatively pure. In the drying chamber the producer gas deposits whatever impurities may remain on the layers of fibre over which it passes. Here, too, it is dried. The gas is now in a condition to enter the piston cylinder. Before entering into the cylinder, however, it passes through valves which regulate the admission of the air and the correct proportion of air and gas so that an adequate explosive mixture is obtained. In the piston cylinder the mixture of air and producer gas is exploded by a sparking attachment. It is the heat of the explosion and the instantaneous expansion of the gases that provide the energy for pushing out the piston and so imparting motion to the shaft.

Producer gas is a mixture of nitrogen and carbon monoxide, and is obtained very simply in the laboratory by passing a slow stream of air over heated charcoal, as illustrated in the diagram.

This experiment shows precisely what is happening in the furnace of the producer plant. Air, in each case, is drawn over or through a layer of carbon. It is probable that as the air comes in contact with the carbon at the grates, complete combustion of the carbon follows, thus:

$$C + O_2 = CO_2$$

The oxidation of the carbon is accompanied by an evolution of heat. As the carbon dioxide passes through the upper layers of burning charcoal it is reduced to carbon monoxide,

$$C + H_2O = CO + H_2.$$

Since the oxidation of the charcoal to carbon dioxide develops heat it follows almost naturally that the reduction of the oxide results in an absorption of heat. It is just at this point that the advantage of the system appears, for the carbon monoxide passes from the furnace to the engine without further change, and in the piston cylinder is completely oxidized by the air that is mixed with it. By its oxidation, it delivers up the heat units, which it absorbed in the furnace, to perform work. By a simple modification the thermal efficiency may be increased greatly. If instead of air a mixture of air and steam be passed through the incandescent charcoal the following chemical action ensues besides those above mentioned:

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$$C + H_2O = CO + H_2.$$

The carbon is oxidized to carbon monoxide and develops heat, while the steam is reduced to free hydrogen with an accompanying absorption of heat. Since the absorption of heat is in excess of the evolution of heat by more than 50 per cent. it will be easily seen that the introduction of the steam is a decided advantage. It is true that the nitrogen present acts as a continual diluent, yet the total effective heat units developed by explosion in the piston cylinder in no way suffer, nor does the presence of small quantities of gaseous hydrocarbons materially deteriorate from the advantages of the system.

Wireless Telegraphy in Its Infancy

A Narrative of Early Experiences in the Art of Wireless Telegraphy

By Clyde J. Applegate.

DURING the year 1902, the United States Government, through the Signal Corps, first experimented with the then unknown wireless telegraphy. Newspaper readers at that time would occasionally see a very small article, far down in one corner of the paper, announcing that signals had been received through the air by means of what was called Wireless Telegraphy. Little or no attention was given the subject by the general public. During the summer of 1902, however, the papers announced in very large type, "Marconi signals the letter 'S' across the Atlantic Ocean by Wireless Telegraph."

It is positively known that Mr. Marconi did send signals through the air for a distance of two miles without the aid of connecting wires during 1895. De Forest, in his small office on top of the tall building at 100 State street, Battery Park, New York City, was also working with wireless instruments. He had already succeeded in carrying on telegraphic communication by wireless between his State street station and two other stations located at Staten Island and Coney Island, as well as with a station on the fishing boat *Angler*, which carried passengers to and from the Fishing Banks.

In 1902 the United States Government took up the matter of wireless telegraphy and began experimenting with DeForest instruments. L. E. Harper and myself, both members of the Signal Corps, were selected to carry on the experiments. Two stations were opened up, one at Sandy Hook and the other at Fort Wadsworth, Staten Island. These two points are 22 miles apart. Harper was operator at the Hook, while I was stationed at Fort Wadsworth. The instruments were few at this date, the sending side consisting of a motor-generator of 500 volts, which was stepped up through a transformer to 20,000 volts. The remaining apparatus comprised four leyden jars, a spark gap and a key with contact points emersed in oil.

The receiving side had a pair of head phones, a detector comprising two aluminum wires with a common sewing needle pulled up against them by means of a spring so as to make the contact delicate, a small fixed condenser and an inductance coil the size of a sewing machine bobbin—nothing else. The aerial was composed of two wires on spreaders suspended from one pole.

At first these two stations could not signal each other. Shortly afterwards it was found that the top of our pole was below the embankment in back of which the cannons were located. An additional 30-foot pole was added, and messages were then exchanged without difficulty. It was a very proud day for Harper and myself.

Up till this time no regular commercial work had been done and hardly any steamships were equipped with wireless. One afternoon, as I had the head phones on and was receiving from Harper, I was astonished when some other wireless ap-

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paratus started in sending. I continued to listen to the unknown station and it proved to be located on the steamer *Cromo* bound for Havana, with Miss Alice Roosevelt, Major Harrison and party on board. They were sending messages which were being copied by the Coney Island De Forest Station.

The messages were addressed to Mr. Roosevelt and others and in part would read, "Fifteen miles at sea, beautiful weather, etc." One of them in particular impressed me as to the need of wireless for marine purposes, and it read, "Left my keys in my desk, take charge until my return." This was really the starting of wonderful wireless.

New instruments were very slow in making their appearance in those days and the distance covered was very short. But because of the success we had had, the Government sent Harper and myself to Alaska to equip and operate two stations, one at St. Michaels and the other at Nome, or properly speaking, Port Safety, 24 miles east of Nome. This 24-mile stretch was equipped with a land line. The reason for locating at Port Safety was due to Cape Nome—a very tall hill, located on a direct line between Nome and St. Michaels—which, it was then believed, would interfere with the wireless waves. This supposition was found later to be groundless.

Twelve Oregon pine poles, six for St. Michaels and six for Port Safety, were towed from Seattle in back of the steamer *Tacoma*. Two masts at each station were erected, each mast consisted of three poles reaching a total height of 212 feet. The poles were placed about 50 feet apart. A single pole had proven almost worthless on account of the wind whipping the aerial around the mast. The aerial was 180 feet long and consisted of 30 No. 16 bare copper wires. At that time horizontal aerials were believed the best.

In October of 1903, the two stations were completed with the exception of a few small instruments that were to arrive on the steamer *Oregon*. This steamer had an accident and was towed into Dutch Harbor. It was then too late to send any others as navigation closes the last of October, so we had to manufacture the key, spark gap and leyden jars. We were unable to send or receive signals over this 112 miles that separated St. Michaels and Port Safety all during the winter. Our different experiments were made known to each other by mail, which took a month to receive a letter that was carried by dog team over the ice.

The following summer the required instruments, with one or two modern ones, were received and communication was established in September of 1904. The signals were very loud and business was at once started, opening up telegraphic communication between Nome and the outside world. The messages were sent from St. Michaels by land line to Valdez, Alaska, and thence by cable to Seattle where the Government turned them over to the commercial companies. The rate charged was $7.50 for ten words.

Previous to the installation of wireless telegraphy at these two points, a cable had been laid between St. Michael and Port Safety, but each spring when the ice would go out, it would drag the cable with it. This meant a loss of thousands of dollars and a delay of several months before a new one could be laid.

Nome was fast becoming too important a business center to allow such delays in its telegraphic business, so when wireless was yet very young it was put to a test at this important point and readily proved its value.

In the fall of 1904 I was sent back to the United States to be treated for my eyes which were in a very bad condition. Later, at the General Hospital at San Francisco, I was discharged in March, 1905, totally blind—caused by the flash of the spark gap paralyzing the optic nerve. My case was the first on record in the Government service, although the French Government had experienced a great deal of eye trouble among its wireless operators. The spark gap is now enclosed in a steel jacket to eliminate this danger.

Harper is still in the Government service and wrote me a short time ago stating that he was again in Alaska, at Nome, where the wireless station had been transferred from Port Safety. A 10 kw. station now replaces the old 2 kw. and a large steel structure takes the place of those grand old Oregon pines.

Hearing of all the new instruments used in wireless telegraphy to-day, I often stop and wonder how it was possible to work with the few that we had

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in 1903. What other wonderful discovery can compete with wireless telegraphy? At the present writing it holds a record of saving over five thousand persons from a watery grave since 1909.

News just received states that the station at Nome has been washed out to sea by a mighty storm on Behring Sea. This will again throw Nome in a panic although there is no question as to a new station being erected at once. But till this is done the old system of dog teams to St. Michael will have to be resorted to. Wireless will be appreciated more fully in the future by those concerned in this out-of-the-way spot of the far North.

A WIRELESS RESCUE AT SEA

A repetition of the tragic *Volturno* disaster is represented in the recent fire on board the Spanish steamer *Balmes*. The fire on the steamer was discovered at 11 o'clock p. m., and the crew, seeing that resistance to the flames was practically impossible, summoned aid by means of wireless telegraphy. The call reached the *Pannonia* about 180 miles away. The British cruiser *Suffolk* also answered the call, but was too far away to transmit readable messages. The *Pannonia* responded to the appeal for help, and raced at top speed to the assistance of the *Balmes*.

Arriving at the scene of the steamer in distress the next evening, the *Pannonia* succeeded in taking 103 passengers from the burning steamer. This rescue was effected while the sea was very agitated. The crew of the Spanish steamer remained on board in order to navigate the ship and fight the flames. As a result the steamer was towed into St. George's harbor, Bermuda, and the fire was finally subdued.

ANOTHER WIRELESS RESCUE

In a recent issue, *The Telegraph and Telephone Age* states that wireless telegraphy was again employed for securing help in times of danger at sea. An outbreak of fire occurred recently in the cargo of cotton on the steamer *Berkshire* off the coast of North Carolina, endangering the lives of one hundred passengers. Aid was summoned by means of wireless, and the passengers were taken from the ship while it was about fifty miles away from land.

"COLD LIGHT" A NEW RAY

There is widespread interest among the few American savants who hear the distant Parisian rumors of Professor C. F. Dussaud's new discovery of the so-called "cold light." A Johns Hopkins visitor in Paris has just communicated the fact for the first time.

Professor Dussaud's method is to supply an ordinary tungsten filament lamp with a voltage much in excess of that for which the tungsten was originally intended. The amount of this extra voltage varies with circumstances but should not exceed 150 per cent. of the original.

Thus, if you take the common hundred volt lamp, you should in these experiments run it intermittently at say two hundred and fifty volts. The intermittent rest intervals must be two-thirds of the "going" intervals. You will then obtain a brilliant light without the filament showing any signs of failing. The latter is caused by the continuous action of the current and the intermittency does away with it.

If you group your lamps by threes, and have each of the three supplied in turn, a uniform light will be visible. Short filaments in spiral form also give a very high candlepower.

True "cold lights" such as the glow worm's, the firefly's and phosphorescent bacterial lights, are of course not approached exactly by Professor Dussaud's Parisian light. No incandescent light so far discovered is "cold." While the bacterial "lamps," the glow worm and firefly's light are all at a maximum of efficiency, the efficiency of the best electric incandescent lamps is only 1 per cent. of the energy applied.

That is to say 99 per cent. of the power used is not seen; only 1 per cent. is visible. Even a tungsten filament run at 2,500 degrees of heat would only give a 6 per cent. efficiency, and at 2,800 degrees tungsten melts.—*L. K. Hirshberg.*

WIRELESS IN WARFARE

In the recent extensive warfare carried on in the Balkan states, wireless telegraphy played a very important part. It is said that before the outbreak of hostilities, Germany supplied fourteen complete equipments for radio communication to Greece, five to Turkey, and two to Bulgaria.

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The Mental Side of Wireless

A Phase of Operating That Has Been Generally Overlooked Although of Paramount Importance

By Alfred C. Pickells
(U. S. Radio Inspector)

IS the work of the telegrapher mechanical, or does it involve action on the part of the little cells of gray matter?

One occasionally hears such a question in these days when operators have come to be so much in demand by the increase in the use of radio telegraphy. But how often do the questioners stop to consider the appearance of a telegrapher when he comes off duty after a hard day's work or after a hard watch aboard ship? How often does one stop to note that tired look in the eyes, the drawn expression of the features, that frequent little twitching of the muscles that speak of overwrought nerves? One might, by analyzing these signs, find the answer without further investigation.

Just a glance at a mechanical occupation and one that is a combination of mental and muscular effort might reveal an interesting comparison. The man who operates the loom or plies the needle or handles the brush or trowel does so as the result of a drill in which he has been trained for a longer or shorter period of time. His hands or feet, or perhaps both, pass through certain motions that have become a part of the routine of his life, and during those moments his mind can be on a thousand and one different subjects while his hands and feet guide themselves. After his day's work he appears tired, but it is from physical wear, and he works on for years with no other ailment but that same sense of fatigue at the end of the day.

But what of the operator? During his watch he either operates the key or the pen or the typewriter. From the beginning to the end it is a steady grind which comes from not merely the act of operating the key but from the variation in the work that causes a continual concentration of his mind. He, too, feels that sense of fatigue, but it is a fatigue that is far worse in its consequences.

One or two little incidents might serve to better illustrate some of the effects which telegraphy produces when the strain on an operator reaches beyond the limit of endurance. A few years before the enactment of the law prohibiting duty longer than nine hours by railroad telegraphers, a serious train wreck occurred on one of the larger roads of the United States. The official investigation of the accident placed the blame on the operator at the tower which the train passed prior to the accident, the cause being stated as due to the throwing of the wrong switch. The operator had disappeared immediately after the accident. Three days later he appeared at a farmhouse, several miles away, suffering from brain fever. When he became convalescent he said that he had been worked for twenty hours a day for nearly a week prior to the accident, and that during the day preceding it he had had neither sleep nor sufficient nourishment, never having left the tower for twenty-four hours. The most significant part of his statement, in this respect, was to the effect that for several hours previous to the passage of the ill-fated train each tap of the sounder sent pains through his head as if some one were clubbing him. He remembered neither receiving the order for the train nor throwing the switch, although he had written the order in the usual manner.

A similar case occurred in Washington during the last strike of commercial telegraphers, when one of the strike breakers, after working for thirty-six hours on a stretch, suddenly sprang from his chair and cried out in tones of agony as he pointed to the sounder, "Stop it; for God's sake, stop it! It's killing me."

There is a suggestion from these two cases which might take us back to the days of the Inquisition, because there is a similarity which possibly indicates that brain currents are very active in telegraphy. The history of those days of

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torture tells us of the ice machine, an instrument with which the victim was given probably the slowest and most excruciating pain of all the methods used. The victim was strapped in a chair from head to foot immediately beneath a tank of ice water which dripped at the rate of one drop in each fifteen seconds upon a spot near his forehead from which the hair had been shaved.

From the psychological standpoint this is one of the most accentuated forms of mental strain to which even the strongest brain must eventually succumb. The method of new thought to relieve pain is to shift the brain currents suggesting that pain; in other words, to forget it, and the pain is supposed to eventually disappear. But what is one to do when the pain is insistent, though intermittent? The shifting process might not last so long for the brain currents at each drop of the ice water become stronger, the resistance to each sensation of pain becomes weaker.

Using an electrical analogy, suppose we consider the action of a motor-generator under two conditions, first, when used as a power supply under steady load; second, when used for the generator of a radio transmitting plant. When the starting lever is thrown over on the power set the amperage reaches a certain amount, finally remaining at a fixed point which indicates the full load. This shows that the pull of work required of the motor-generator is steady. Under these conditions it will run for years with but little overhauling.

When the same set is used as a source of power for a radio transmitting set and running free, the load is only that necessary to turn the armatures. As soon as the operator presses the key, however, the full load is thrown on and is indicated by a slowing up of the motor. The fact which stands out prominently, therefore, is that the motor upon which an intermittent load is thrown is the one which is under the greater strain, the one which is going to break the sooner under this strain.

In studying the action of the brain in the work of the telegrapher a very close resemblance is found in the strain under which a radio motor-generator set works, and to the action of the brain cells which suggest pain as in the case of the ice machine. In transmitting it is necessary to read the message, and this intelligence must be absorbed by one set of brain cells, and transmitted by another set to the muscles of the arm and fingers. Likewise in receiving, the tap of the sounder or the buzz of the phones tells one set of brain cells a message which is in turn imparted to the set which gives motion to the arm and fingers when the telegrapher moves his pen. Now add another feature in wireless, the struggle to get signals from a weak station or when there is interference from static or other stations. The result must be the further straining of those cells which tell the telegrapher to listen, and the chances are that the operator who is overworked will suffer the same effect as the neglected motor-generator which receives an intermittent full load.

Experiences of operators, and especially radio operators, bear out these suppositions to a considerable degree, and it cannot be wondered at that at times they become irritable. It is often the case, especially in an operating room exposed to full view on board ship, that passengers, ignorant of the strain which the operator may be under in trying to receive weak signals, will "break in," so to speak, with questions about baseball scores, the weather, the latest news in national affairs, or speak of the wonderful combination of apparatus which the operator controls, and it sometimes happens that they are more or less shocked by an outburst of language which they did not expect to hear.

Not long ago an operator on one of the coastwise ships had received a call from a vessel very nearly to the limit of its range and was struggling to get its message. He could secure only small portions after repeated and hard efforts. Finally, with his head buzzing with signals which perhaps never came through the air at all, he tore the phones from his head, threw them on the floor, and dashed out to the open air of the deck. Afterward he said that he felt as if a band were being gradually tightened about his head so as to burst it, and for some time after being relieved, confused but faint signals still rang in his ears.

In the early days of wireless when test signals were used so much in the development of each individual piece of apparatus, most of the experimenters were afflicted temporarily with nights of al-

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most entire wakefulness. During these sleepless periods they all experienced the same effect—they heard D's or V's in their waking moments, and saw them in their dreams when they dozed off for a few minutes only to be awakened by the specter of a big D or V coming at them in revenge. Even in the day time they heard them at intervals in leisure moments, and saw them in confused masses in the pages of the books they were reading.

As if radio operators were to be particularly taxed by brain action, German physicians have recently discovered that radio-transmitting sets, especially those on shipboard in narrow or cooped-up quarters, have a tendency to weaken the operator, because of the excessive ozonizing of the air. They describe the action as being a reduction of the red corpuscles in the blood, appearing as an anemia, or blood deficiency, with a consequent general weakness. Herein the effects are still more noticeable because the brain, to be in normal condition, must be supplied with a certain amount of blood.

ANOTHER TRANS-ATLANTIC WIRELESS STATION

A high powered wireless station for trans-Atlantic communication is being erected at Newcastle, N. B., by the Universal Radio Syndicate.

The Newcastle station will have a central tower 500 feet high and six auxiliary towers of 300 feet in height. Between the supports will be stretched a network of copper wires in the form of an umbrella. For the aerial alone there will be used from 120,000 to 150,000 feet of wire aside from about 100,000 feet that will be employed for the ground. The station will have a 40-kilowatt transmitter, and will communicate with a similar station in course of erection at Ballybunion, on the southwest coast of Ireland. The distance between these two stations is about 2,700 miles. It is stated that the Newcastle station will also be able to communicate to another station of the chain located at San Francisco, a total distance of 3,200 miles, entirely overland.

WIRELESS IN USE ON RAILROADS

It is interesting to note that Mr. Louis R. Krumm, Chief Inspector of the Bureau of Navigation, Department of Commerce, Washington, D. C., recently inspected the wireless stations of the Lackawanna Railroad Company at Scranton, Pa., and Binghamton, N. Y., granting licenses for the operation of these stations. Radio communication between these points is now being handled as readily as by the usual telegraph circuits. The Lackawanna limited train is being fitted with wireless apparatus which will be used to handle messages while in motion.

A BELGIAN HIGH POWERED STATION

Another high powered station for long distance transmission is being constructed at Laeken, near Brussels, in Belgium. This station will be used for communication between that point and Boma, located in Congo, Africa. At the present time there are already ten wireless stations in the Belgian Congo.

THE DANGERS OF HIGH TENSION CURRENT

The dangers of high tension current are forcibly indicated by an incident which occurred during a recent fire in Harrisburg, Pa.

While fighting a fire that threatened two homes on North Fourth street, Mrs. J. W. Wenrick was badly burned from the current of a heavily charged electric power wire. From a newspaper report, it appears that Mrs. Wenrick threw water on the flames through which a high power electric current was passing. In so doing, the current flowed through the water to the bucket which she was holding and caused serious injuries. When the fire department appeared on the scene and fought the flames, the men had considerable trouble with the electric current which melted the nozzle of the hose. It was only after the wire had been cut by an electrician that the flames were easily extinguished.

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Determination of Aerial Wave Lengths

EDITOR'S NOTE:—In the past the readers have been sending in a large number of inquiries concerning their aerial wave length. Inasmuch as the QUESTIONS AND ANSWERS DEPARTMENT now disregards queries that are not of general interest, this article is a very timely and invaluable one. Any reader through its use can determine the approximate natural wave length of any aerial within the limitations.

From time to time readers of this magazine have written to the Questions and Answers Department, requesting the wave length of some particular aerial, the dimensions of which they gave. For the purpose of enabling readers in the future to obtain this information for themselves, the curves given in Fig. 1 have been prepared for four-wire aerials. They also serve as good approximations for two and eight wire aerials. The wires are assumed as spaced two feet apart. The method of using these curves is as follows:

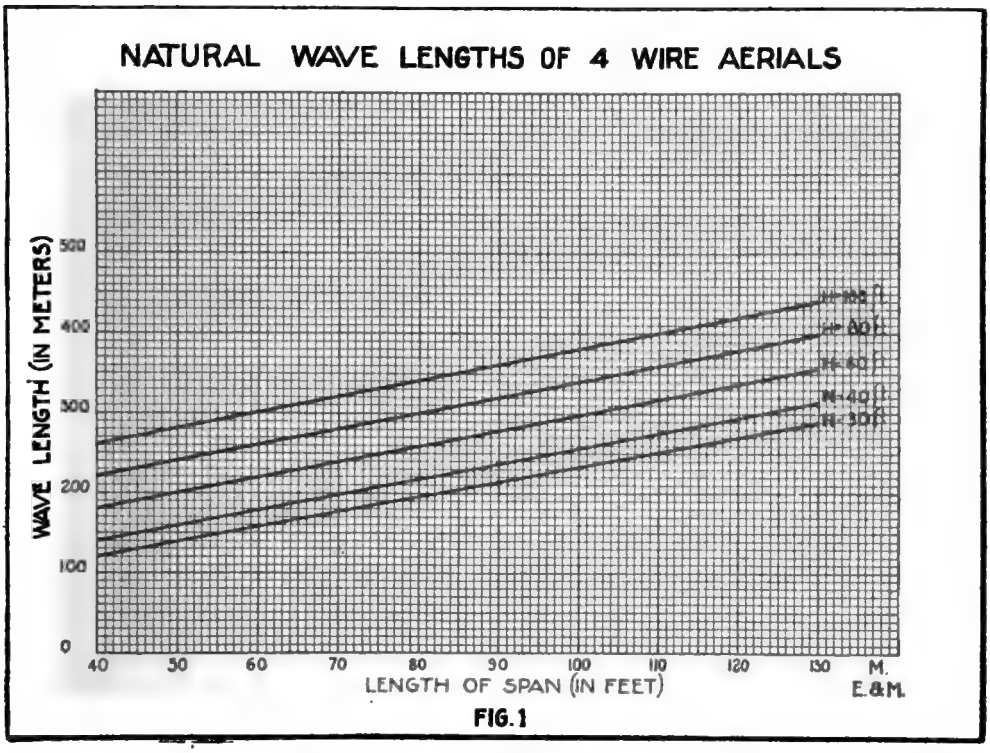

FIG. 1

It will be noticed that there are two scales on the diagram, one vertical (marked *Wave Length in Meters*), and one horizontal (marked *Length of Span in feet.*) Each division on the vertical scale equals 10 meters, and each division on the horizontal scale equals 1 foot. From the divisions of the vertical scale, lines are drawn out horizontally with a heavy line at every tenth division, while similar lines are drawn vertically from the horizontal scale. Thus the paper is divided up into small squares, the purpose of this being to assist tracing the lines up from the various division points at which they start.

Over the squares are drawn several heavy lines, marked H-30 feet, H-40 feet, and so on. These numerals refer to the height of the horizontal part of the aerial above ground. The heavy lines are the curves referred to, and to use them, it is simply necessary to select the particular line which corresponds to the height of the aerial; find the point at which the vertical line that runs up from the division of the horizontal scale corresponding to the span (or length of horizontal wires) of your antenna, crosses it; to follow from this *crossing*

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point the horizontal line nearest to it across to the vertical scale and the division it corresponds to will indicate the wave length of the aerial.

EXAMPLE.—Find the wave length of an aerial 60 feet above ground with a horizontal part or span 100 feet long.

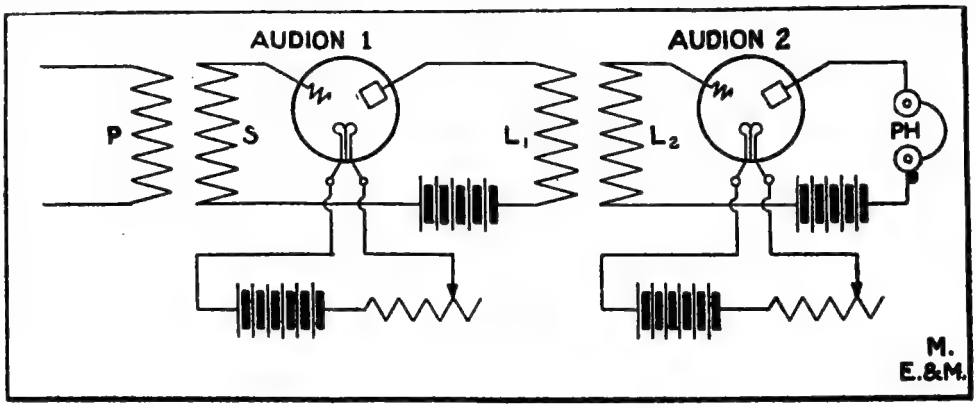
SOLUTION.—Select the heavy line marked H-60 feet; find where the vertical line from the division marked "100" on the "span" scale crosses it, and follow the horizontal line crossing it at this point across towards the left. The division it corresponds to is marked "300," indicating that the wave length of this aerial is 300 meters.

INSTITUTE OF RADIO ENGINEERS

AT the meeting on November 4, Dr. Lee De Forest delivered a highly interesting paper on "The Audion." He treated this instrument as a detector in radio receiving stations and as an amplifier for use on telephone lines. The modern form of the audion, as developed from the elementary instrument, and the circuits used in connection with it were demonstrated, the conditions on which its sensitivity depends were discussed; and proofs were offered in support of the claim that the audion is a trigger device and not a form of valve. A large portion of the lecture was taken up in a presentation of the audion in its latest role—that of an amplifier for weak electric impulses.

In this latest of applications, Dr. De Forest uses a number of audions in the connections shown in the accompanying diagram. Impulses that may be practically inaudible are led into the primary of a step-up transformer (P) to the secondary (S) of which an audion is connected. Across this first audion is connected a coil (L_1) forming the primary of a coupling coil (or a 1 to 1 transformer) to which is coupled a secondary (L_2). This is connected to a second audion, as was P, and across this second audion is placed a pair of phones or a microphone. By reason of the amplifying properties of the audion, the almost inaudible signals in P are heard with intense loudness in the phones, and not only are they very loud but no distortion of the impulses takes place, as it would with the imperfect contacts in a microphone amplifier. Three audions are usually used in this manner, and these were sufficient, at the meeting, to amplify a whisper into a tone loud enough to be heard fifty feet away from a loud-speaking microphone.

Lastly, Dr. De Forest spoke of other uses to which the audion could be applied, as, for instance, a radio calling device, long distance telephone relay, and amplifier for telegraphone records for rapid signals. He performed a number of highly interesting experiments showing the sensitiveness and ruggedness of the device. Discussions by a number of well-known radio men followed the address.



At the December meeting of the institute, Mr. E. F. W. Alexanderson, of the General Electric Company, is to present a paper on the construction and operation of high frequency alternators—a field in which he has been engaged for a number of years.

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Experimental Department

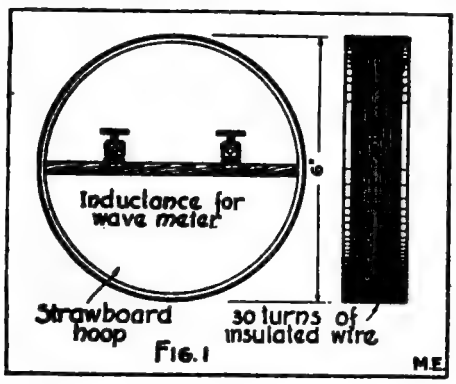
This department is maintained for the purpose of encouraging the experimenter to develop new ideas. Every reader is welcome to contribute to this department. Contributions should be written on one side of the paper only, using as many sheets as are necessary. Typewritten contributions employing double spacing are preferable. Good sketches are not necessary, as our art department can work up rough sketches that are clear enough to illustrate the idea. Sketches must be made on separate sheets from those containing the description. Return postage must be enclosed if return of unused manuscript is desired.

Three prizes of Five, Two and One-Half Dollars and One Dollar are awarded for the three best ideas published each month. Other contributions are paid for at space rates.

FIRST PRIZE

A SIMPLE WAVEMETER

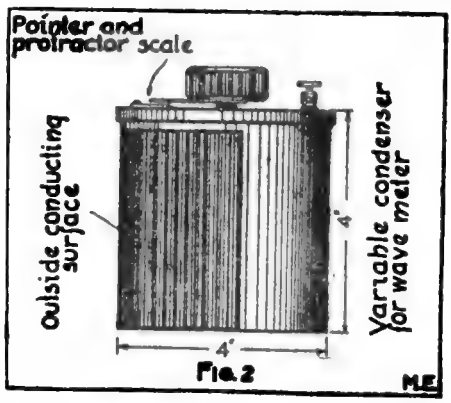
A wavemeter has become practically a necessity in the modern amateur station in order to tune the transmitter to comply with the wireless law. There is nothing really complicated about this instrument and when the radio-inspector comes around to your station he will doubtless have one of a standard make



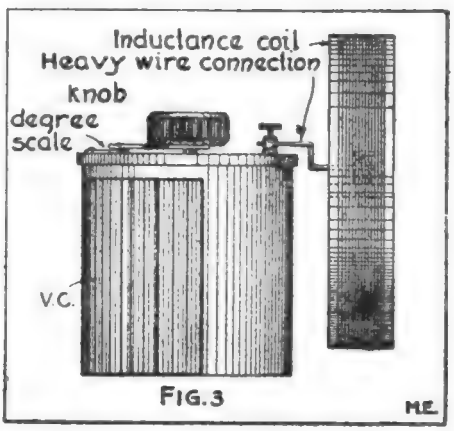
and will be glad to calibrate yours for you.

The inductance for this wavemeter consists of about 30 turns of No. 19 or 20 insulated magnet wire wound on a strawboard hoop 6 inches in diameter. The winding is shellacked and the two ends brought out to binding posts mounted on a seasoned wood crosspiece as shown (Fig. 1).

Any good variable receiving condenser having a maximum capacity of about .001 microfarads may be used for the capacity. If you do not already have one, the kind described in the Experimental Department of the September issue, will serve very well. There is more loss in this type than in one having air as a dielectric, but it will serve well enough for an experimental wavemeter. The condenser mentioned (Fig.



2) is begun by coating *half* of the outside of a straight glass beaker with tinfoil. The inside conducting surface is formed by coating *half* of a strawboard mailing tube—that is just large enough



to fit inside of the beaker—with tinfoil. The tube is then placed in the glass vessel and connected mechanically with a large knob on the cover of the condenser,

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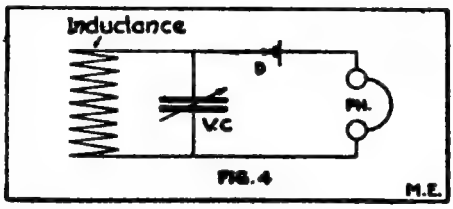
so that the position of the inside tinfoil sheet may be changed with respect to the outside sheet by turning the adjusting knob. A protractor degree scale is fastened on the cover so that a pointer on the knob indicates 0° when the inside conductor is entirely away from the out-



side one. Two large binding posts are also placed on top in a convenient position and connected to the two tinfoil surfaces. If a beaker about 4 inches high and 4 inches in diameter and with glass about 1 millimeter thick can be obtained, it will have about the desired capacity.

The inductance coil and condenser are connected in series with two pieces of heavy wire so as to hold the former in a vertical position (Fig. 3). This makes it easy to place the instrument so that the coil is in a parallel plane with the primary of the oscillation transformer when in use.

For the operation of a wavemeter, information may be obtained from the Radio-Inspector of your district or in previous numbers of *Modern Electrics*.

A pair of 'phones and a crystal detector are placed in series across the condenser terminals (Fig. 4). The 'phones may be shunted by a potentiometer if so desired, to obtain the relative intensity of sounds, or on sets over ¼ kw., a small vacuum tube may be used in place of the 'phones and detector.

For other uses of a wave-meter, see P. Mertz's article in the May *Modern Electrics*.

Contributed by

Manvel Zinn.

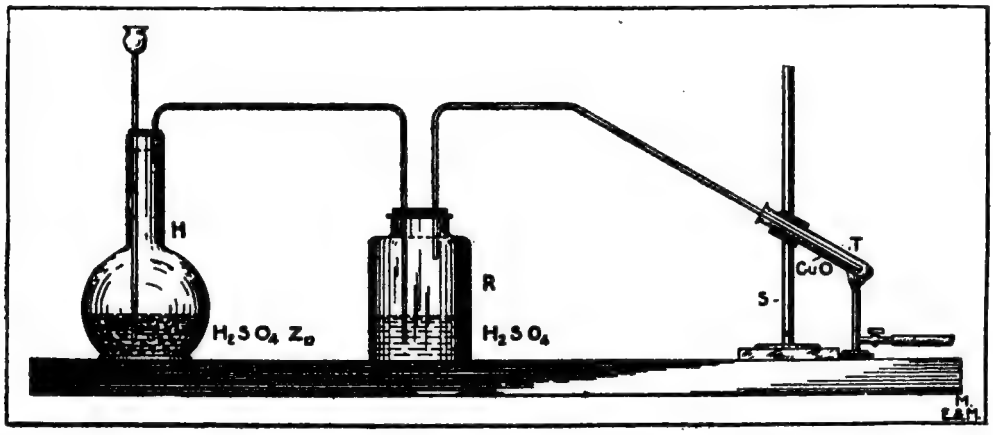
SECOND PRIZE

A PROCESS FOR MAKING COPPER AMALGAM

Some time ago there appeared an article in *Modern Electrics* describing the making of copper amalgam for mounting detector crystals, by the following method:

First, a saturated solution of copper sulphate crystals and water was made, using about a pint of water. Next, after filtering the liquid, zinc was added; the zinc going into solution and the fine copper being precipitated on the bottom of the dish. After the precipitate had been thoroughly washed and dried, it was mixed with mercury to form the amalgam.

Upon trying this, I found that the finely divided copper oxidized instantly when it was exposed to the air. Also, that no amalgam whatever could be formed without first mixing the copper with a dilute (1:6) solution of acid (sulphuric or hydrochloric). After the mer-



cury had amalgamated with the copper, the surplus copper and acid solution were washed out and the amalgam was ready for use.

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This amalgam may be satisfactory for some purposes, but it has a rather muddy appearance because of the excess of copper oxide. This oxide may be removed by using the apparatus shown in the accompanying diagram. But a small amount can be treated at once and this should be used immediately or it will oxidize again.

In the drawing, H is the hydrogen generator, comprising a flask half filled with granulated zinc and dilute sulphuric acid. It is fitted with a rubber cork, in which are placed a thistle-tube and a delivery tube. The end of the thistle-tube should be below the surface of the liquid and whenever the action slackens, more acid may be added through it. R is a wide mouth bottle, in which is placed about an inch or so of concentrated sulphuric acid which serves to dry the gas. The delivery tube from the generator runs beneath the surface of the acid, and the second delivery tube runs from the wide mouth bottle to the bottom of a hard-glass test-tube, I, which is clamped in a stand S. A small amount of copper (about a teaspoonful) is placed along the side of the test tube. After the generator has been in operation for about four or five minutes, a small flame is held beneath the test-tube. The flame must be kept in motion or the tube will melt.

When to all appearances the copper has resumed its original color, it may be removed and used.

Caution: When through with the apparatus, remove the first delivery tube from the acid bottle R immediately or you will have an explosion.

Contributed by

Bryan G. Barker.

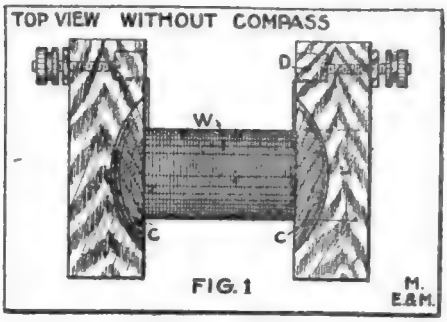
THIRD PRIZE

A SIMPLE GALVANOMETER

The dimensions of the instrument described in this article, depend upon the size of the compass used. The dimensions given are to be used with a compass having a diameter of 1¾ inches.

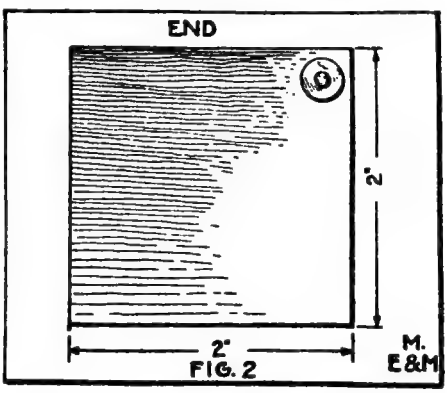
Two end pieces 2 by 2 inches preferably about ⅝ inch thick, and a wooden core 1¼ by 1 by ¾ inches are required.

With a knife and chisel cut the hollows marked C, into which the compass fits, and drill a ⅛-inch hole in each end piece for the binding posts, which are secured from battery carbons. Placing the center of a bit in the ⅛-inch hole,

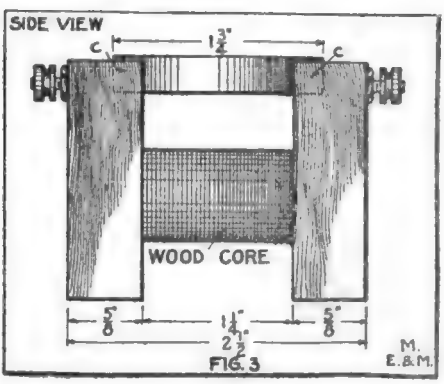


drill a ⅜-inch hole half way through, from the side the hollows are on.

Round off the edges of the core slightly and fasten it between the ends, ½



inch from the bottom, with glue or brass nails—use nothing magnetic. For the winding any insulated wire having good conductivity will do. I used ordinary



bell wire on mine, wound till it came even with the bottom of the compass.

After winding, glue the compass in the position shown, and the instrument is

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ready for use. To use the instrument, set it in such a position that the needle points to "N" on the compass, and it will be found that a very weak current will throw it toward "W" or "E," according to polarity. If the needle settles quickly at "E" or "W" the current is quite strong.

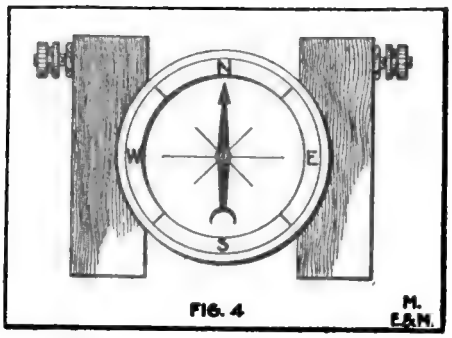


FIG. 4 M. E&M.

A small magnetized object placed at the "N" will allow the use of the instrument in any position, but will destroy to some degree its accuracy and sensitiveness.

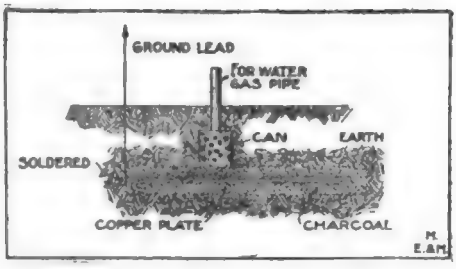
This instrument is useful enough to justify its construction by any experimenter, since it can be made at practically no expense or labor.

Contributed by

Raymond Watts.

AN IMPROVED METHOD OF GROUND CONNECTION

Many wireless experimenters do not have access to the city water mains for grounds and consequently lose much efficiency in poorly constructed grounds. It is the purpose of the following article to enable those persons to obtain a very good ground without much time or expense. First, obtain as large a copper plate as possible and solder it to the ground lead. Bury this plate as deep as possible between well crushed charcoal.



Next, obtain a large can with an opening in the top large enough to admit a gas pipe. Punch holes in this can on the bottom and sides and insert the pipe a few inches. Then cover the can and plate with earth. Water poured in the top of the gas pipe will spread over the surrounding strata of earth insuring a damp ground at all times. A ground of this type is in constant use at the writer's station and has increased the efficiency over fifty per cent.

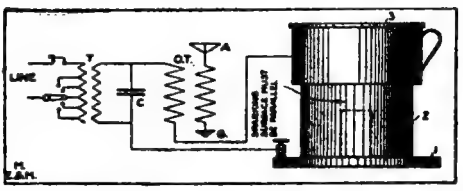
Contributed by

Edson L. Nott.

A "TEMPORARY WATER-COOLED GAP"

While my rotary spark gap was in process of construction I tried several forms of gaps including the "Good Toned One" described in No. 8, Vol. 6, of *Modern Electrics* with the result that a station 16 miles distant could not tune me out with a Blitzen tuning transformer. I had the set carefully tuned by means of a helix and used ½ kw.

A gap made in the following way gave



a superior tone to all the gaps tried when transformer and condenser were in resonance. No one would use a straight zinc air cooled gap after having tried the gap illustrated in the accompanying sketch.

In the illustration, 1 is an aluminum casting with a lug that is at least one inch in diameter. In the gap that I made this casting happened to be one intended for a rotary spark gap. 2 is a fibre tube with an inside diameter one inch larger than the lug of the casting, so that the spark will not arc along its surface. This tube must be as long as the lug of the casting plus the distance that the spark must jump. 3 is a tin cup filled with water.

By referring to the sketch all the working parts may be clearly understood as well as the wiring connections when using it with an oscillation transformer.

Contributed by

Leroy Clausing.

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A NEATLY DESIGNED RECEIVING SET

The cabinet receiving set shown in the accompanying drawings is of very neat appearance and greatly resembles the set used by the Marconi Company.

The sides and bottom of the cabinet should be made of well seasoned wood, while the top can preferably be made of hard fibre that is afterwards highly polished. The cabinet should be large enough to hold the two couplers contained in it.

The loose couplers should be wound with D. C. C. copper wire and inasmuch as there have been numerous descriptions of loose couplers in previous issues of *Modern Electrics*, the author leaves the sizes of wire to the option of the reader. However, there should be wound 170 turns of wire on the primary, taking nine taps of 17 turns each which are connected to one of the switches. The remaining 17 turns should be brought out to a 17 point switch on the front side of the cabinet. The secondary is tuned with 12 taps and is adjusted by means of the knob next to the secondary switch.

On the right-hand side of the cabinet will be noticed an arrangement similar to the one on the Marconi multiple tuner. It is used for tuning in long wave lengths. If the switch is moved to the right, only one coupler is in circuit, but if moved to the left both couplers are connected in series, therefore eliminating any loss that might occur if a loading coil were employed. The secondary coupler has its windings stationary. This method of tuning was fully described in the March number of *Modern Electrics*.

The hook-up for this set is shown in Fig. 3. The bars connecting the switch arms together are made of fibre or hard

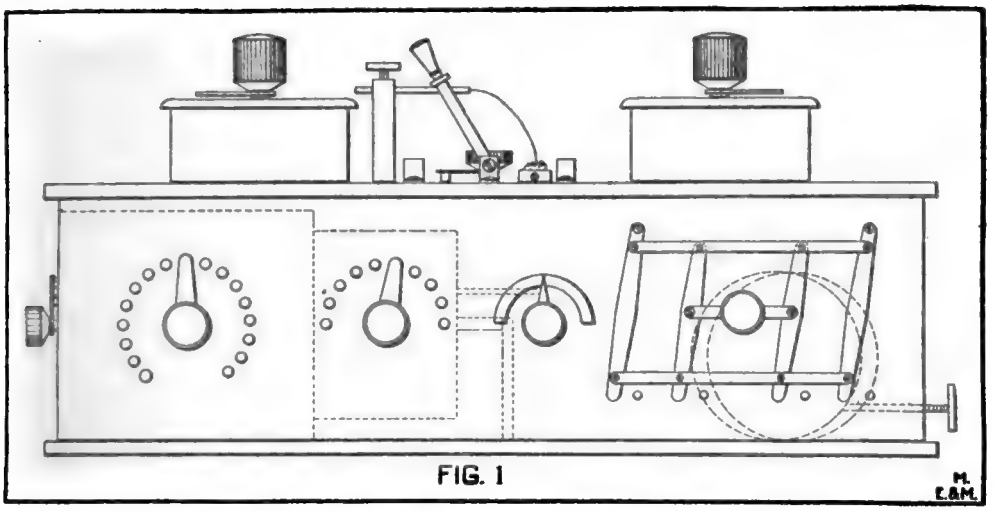

FIG. 1

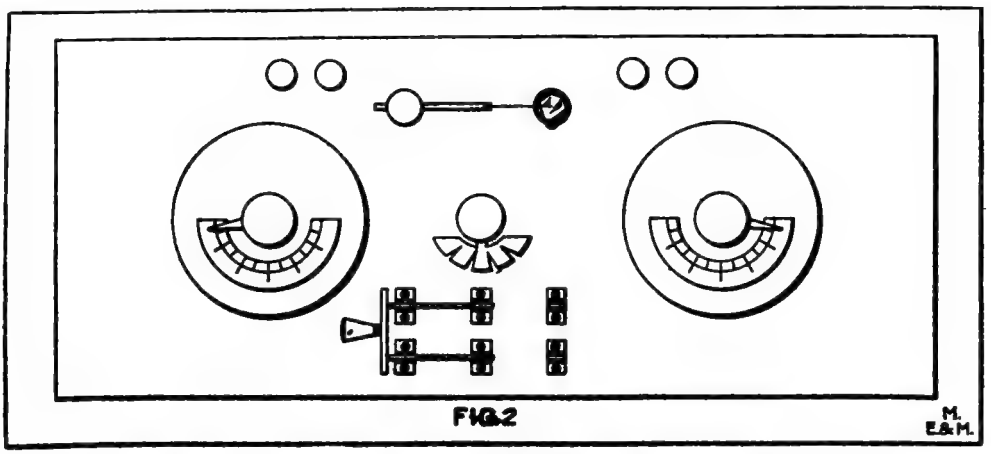

FIG. 2

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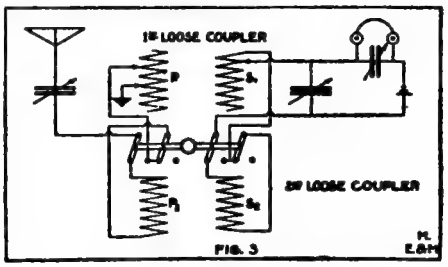
rubber. The knob on the right varies the coupling of the second coupler.

On the top of the cabinet are placed two variable condensers employing air as a dielectric, a galena detector, a shorting switch and a fan type switch for the semi-variable condenser.



The latter switch controls the last five plates of the condenser placed across the phones. This is all the description that is necessary inasmuch as the drawings will show the arrangement and construction of the minor parts. The cabinet should be tilted about 20 degrees towards the operator to facilitate its manipulation.

Contributed by

Robert C. Martin.

AN IMPROVEMENT ON THE "FOOL PROOF" BURGLAR ALARM

I have read the article in the November issue of *Modern Electrics* about a fool-proof burglar alarm. If a burglar wanted to rob a home that was protected with that system all he would have to do would be to find the polarity of the line and connect on a couple of dry cells. Everything on the other side of the batteries would be "dead." I therefore have made an improvement on the system—one that is fool-proof.

The gravity batteries should be placed at the end of the line. Connections for windows or doors can be taken in series or tapped as shown in diagram.

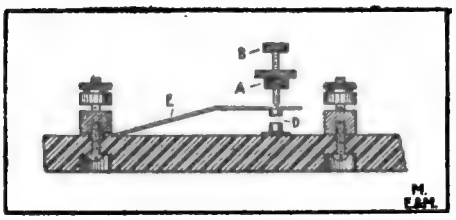
Relay 1 then operates, if there is an increase of current on the line, on an instroke. Relay 2 works, if there is a decrease of current on the line either from a cross or open, on an outstroke. An automatic drop is used to cause the continuous ringing of the bell.

Contributed by

James J. Gilligan.

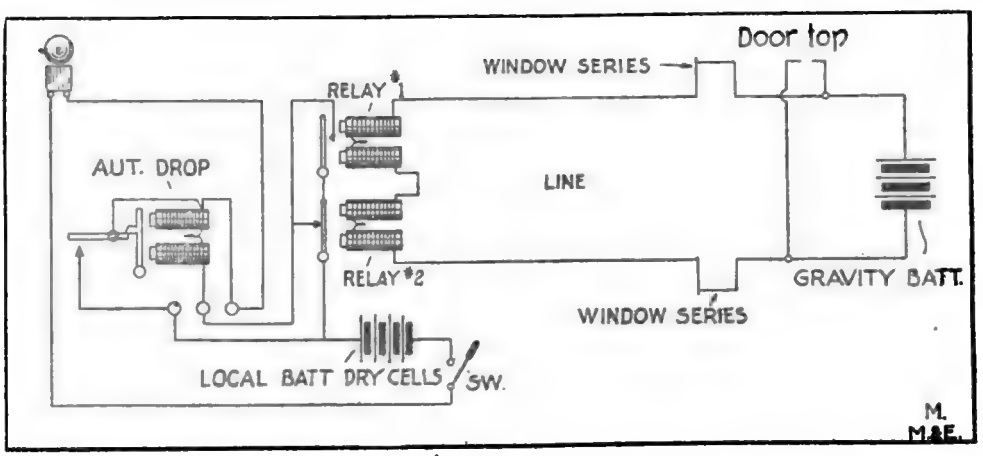
BREAK KEY CONTACT

A good break key arrangement can be made by placing a hard rubber arm, A, across the key lever between the adjusting spring and the knob. When the key is pressed, A, which supports the adjusting screw B is correspondingly lowered, thus closing the platinum contact D. E is made of spring brass. This break is easily constructed and no trailing wires, which detract from a good adjustment of the key, are needed.



Contributed by

I. Farwell.



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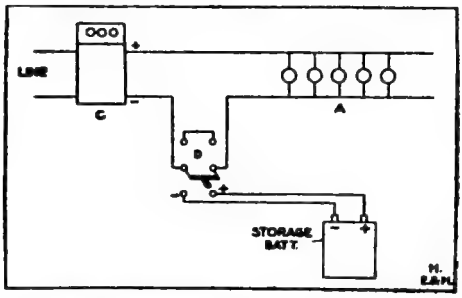
A METHOD OF CHARGING STORAGE BATTERIES

The accompanying diagram is a method of using the house wiring to charge storage batteries, in which A represents the lights, B is the battery to be charged,



C is the meter and D is a double pole double throw switch with two of its poles connected together. When the battery is not being charged the switch is thrown to the pair of jaws that are connected together. Care should be taken to connect the positive pole of the battery to the positive pole of the circuit and the negative pole of the battery to the negative pole of the circuit.

The battery can only be charged at night when the lights are turned on.

Contributed by

Ernest Borho.

A HOOK-UP FOR ELIMINATING CLOSE-BY INTERFERENCE

In the course of my experiments I have found a hook-up that makes it possible with ordinary apparatus to tune out large, near-by commercial stations and read weak, distant amateur stations with ease. This hook-up also permits of reading faint signals through heavy static interference.

With my receiving set in Cleveland I have been able to hear a large number of Canadian stations as well as boats a considerable distance away, despite the close-by operation of large commercial stations, by means of the accompanying hook-up.

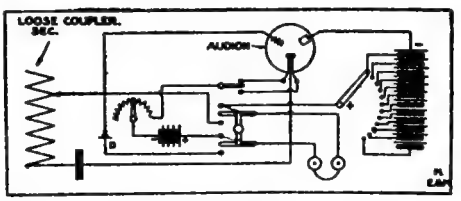
Contributed by

Harry E. Downing.

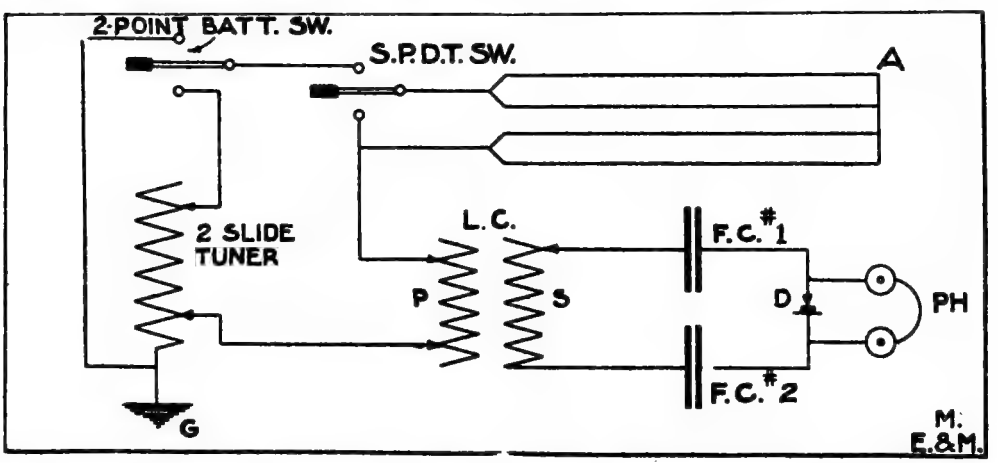
IMPROVED AUDION AND DETECTOR HOOK-UP

An excellent article on a good receiving set by B. N. Burglund appeared in a recent issue of *Modern Electrics*. No doubt many amateurs would be pleased to build a set similar to the one described but are held back by the complicated switch arrangement shown, since this is one of the weak points of all amateur instruments as the switches sometimes fail to make contact.

To overcome this and greatly simplify



matters I have worked out the hook-up shown in the accompanying illustration. By means of a single D. P. D. T. switch a complete change is made from the audion to the detector by one throw and the high voltage phone circuit and the filament battery circuit are both closed by the same movement.



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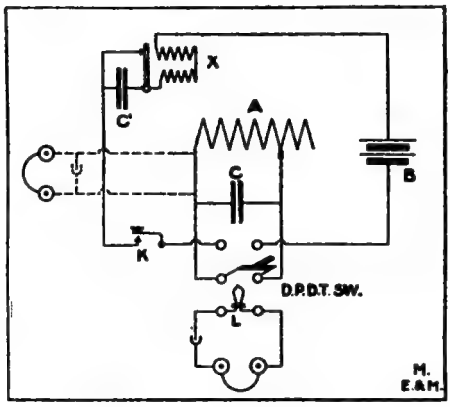
This hook-up, I hope, will help some amateurs in making an up-to-date receiving set. A variable condenser across the secondary to tune in long waves; a variable condenser for the primary, that can be connected in series or in parallel by means of a switch; and a "stand-by" and "tune" switch are refinements that are not absolutely necessary and have not been included in the diagram, but add to the beauty and usefulness of any set if included.

Contributed by

Thos. W. Benson.

A NOVEL TYPE OF WAVE-METER

Since the new wireless law has gone into effect very few amateurs know, as regards wave-length, whether they are within the requirements or not. Below I will try to describe a wave meter that gave me great satisfaction. The dimen-



sions must be followed closely as a small mistake will cause the meter to measure the wave-length incorrectly.

The variable inductance A is made from a core of 3½ inches in diameter, wound with No. 28 enameled or silk covered wire. A small fixed condenser C is shunted across this inductance. It must have a capacity of .00005 M F. To obtain this capacity the reader must use one plate of glass ⅛ of an inch thick with a sheet of tinfoil 2 by 3 inches fastened on each side. X is a small buzzer and C' is a small condenser to absorb the tick of the contacts. B are the batteries. The rest of the diagram needs no explanation.

To find your wave-length insert a small lamp at L and close the double pole switch so that the detector (any kind) and phones are in circuit with the inductance and condenser. Press the key of your sending set holding the wave meter a short distance away and keep moving farther or closer until the lamp just glows. Now move the slider until you hear it loudest in the phones, then following the formula given below you can work out your wave-lengths.

20	Turns.....	155	meters
40	"	212	"
60	"	330	"
100	"	500	"
200	"	900	"

To find the wave-length of another station, throw the switch in the opposite direction so that the exciting circuit is hooked in. Now press the key K of the exciting circuit until you hear the same wave in the receivers as of the other station and work it out by the same formula. It is optional as to where the phones are hooked in.

Contributed by

Richard Zinn.

AN ELECTRIC FOOT WARMER

The following device will be welcomed by persons who suffer from cold feet at night:

Procure a tin can about 8 inches long by 3 inches in diameter and punch six rows of holes half an inch apart in the side of the can with a nail or brad awl. Fasten a porcelain base socket on the inside of the cover with a bolt passing through the cover and the bottom of the socket. Bring two leads of lamp cord out through two socket bushings placed in holes cut in the cover. An extension plug on the other end of the cord forms a ready means of connecting to the 110 volt lighting circuit.

Now for the heating element. It is a well-known fact that an incandescent lamp while burning gives off more or less heat, the amount of heat depending on the size of the lamp. For this heater an 8 c. p. carbon lamp will be required.

Place this heater in the bed when you begin to undress, and by the time you are ready for bed it will be quite comfortable. Then turn off the current and enjoy a good night's rest.

Contributed by

R. S. Crawford.

Note.—Don't leave current on after getting into bed or you may wake up and find yourself on fire.—Ed.

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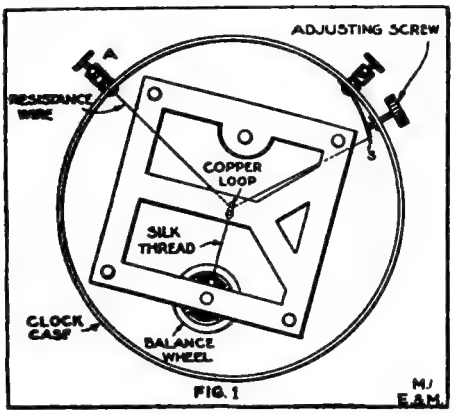
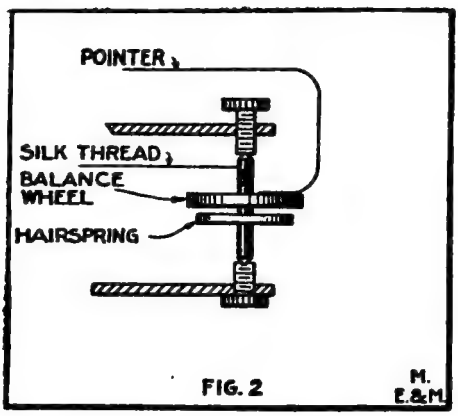
A REALLY GOOD HOT WIRE AMMETER

All the well equipped amateur stations have a hot wire ammeter but a good many less fortunate readers could



use one with good results. The meter here described is easily constructed, simple and has the much desired commercial appearance.

By looking at the drawings it will be seen that it is constructed of an alarm clock from which the works—with the exception of the balance wheel—and bell have been removed. Any old alarm



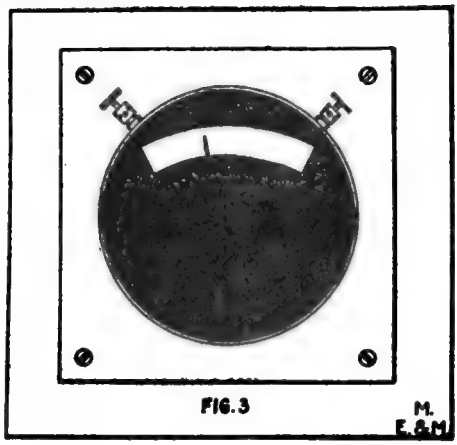
clock will do if it has the case in good condition and the balance wheel and supports still in it.

As clocks vary in details it would be impossible to give accurate dimensions, so the builder will have to use his own judgment in locating the binding posts and other parts. I will therefore give only general directions.

Binding post A is insulated from the case, strip S under the other post is 2 by ¾ inches and is made of spring brass. The resistance wire is passed through a small hole in the end of this strip and fastened on the back with a drop of solder. The adjusting screw, screwed through an 8-32 nut soldered against the inside of the case presses against the strip. The silk thread, wrapped around the shaft of the wheel, ends in a small loop of copper wire through which the hot-wire passes. The pointer is bound to the wheel with fine copper wire as shown in fig. 2.

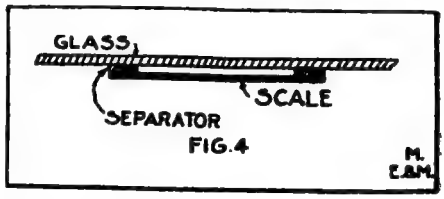
The case should be fastened to a backboard a little larger than itself in order to facilitate fastening to the wall.

The case is enameled black. The glass for the front is painted black leaving a space clear, as shown, for the scale



which is raised from the glass by being pasted on two pieces of cardboard. Fig. 3 is a view from above, the pointer traveling between the glass and the scale which may be calibrated to suit requirements.

For high powered sets a shunt may be necessary, and if so, it can be soldered to the binding posts inside the case.



By frequently referring to the drawings the description will be clear and I doubt if further explanation is necessary.

Contributed by

Thos. W. Benson.

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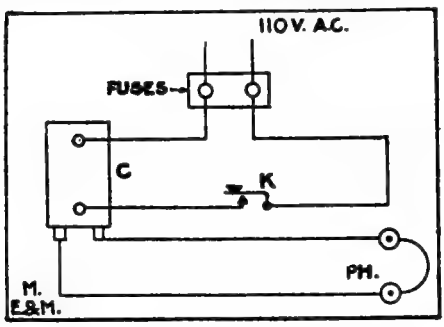
ANOTHER METHOD FOR CODE PRACTISING

The method shown in the accompanying diagram is a simple and easy method to practice sending and receiving, and the sound produced is identical to that of an incoming wireless message.

The coil C is a one-half inch coil. Although a one-inch coil might work, the current taken from the primary ter-



minals (secondary, when the coil is used as in the diagram) would probably be very weak. The rest of the hook-up is clearly shown in the drawing.

If the key contacts are set very close together so that it will make no noise, the only sound heard will be that in the receiver. A small step-down transformer will work equally well, but should give no more than three or four volts on the secondary terminals.

Contributed by

Bryan G. Barker.

"LIGHTS OUT" ALARM

This is a system which I have had in use for several years in connection with the electric range lights at the entrance of a harbor.

The relay A is wound with No. 12 magnet wire. Relay B is 500 ohms. The accumulators and relay A are at the power-house and relay B is at my house about a quarter of a mile away.

The time switch C is set to turn the lights off at daylight and the time switch at the house is set a quarter of an hour earlier to prevent the bell from ringing when the lights go out in the morning.

The spring on relay A is adjusted to a sufficient strength to pull back the armature if the voltage drops below 85.

Contributed by

J. E. Cornwall.

A SUBSTITUTE FOR SAL-AMMONIAC

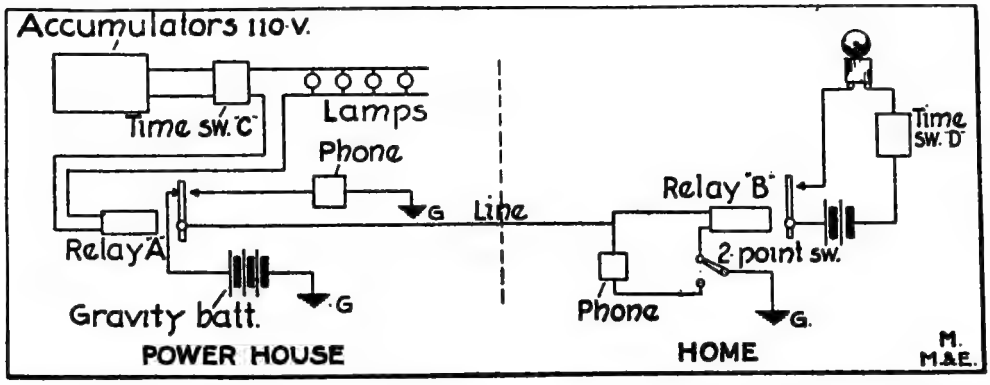
In the October issue of *Modern Electrics* on page 704, there appeared an article describing a substitute for sal-ammoniac. I have made several experiments with wet cells on the subject and have found that one cupful of pure crystal salt to an ordinary wet cell will give excellent results. To obtain complete satisfaction, it is necessary to short circuit the cell for a few moments. The E.M.F. per cell using salt will average from 1.4 to 1.6 volts.

Contributed by

Edward M. Wolfe, Jr.

CLEANING OLD PHOTOGRAPHIC PLATES

Readers of *Modern Electrics* who wish to build condensers using old photographic plates as a dielectric will welcome this very clean and simple method of removing the emulsion coating.



Wet the film side of the negative and dry immediately after with a cloth. Make a scratch across the entire film side of the negative with the thumb nail,

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deep enough to penetrate the coating. Take the negative in both hands with the film side upwards and pass both thumbs firmly over the scratch whereupon the film will roll up off the plate. Continue this process until you have rolled the film entirely off, which is done very quickly.

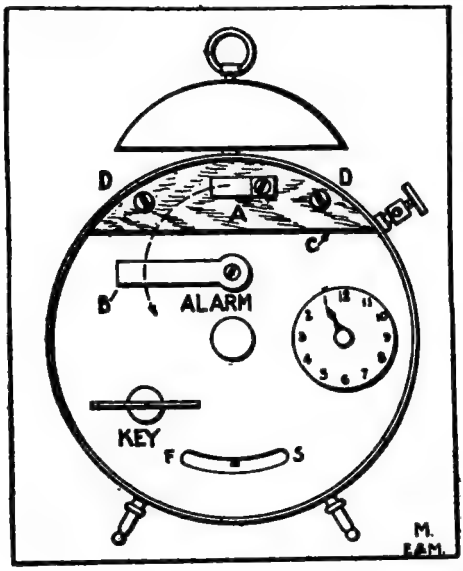
Contributed by

Jos. C. Behre.

A TIME SWITCH

The accompanying sketch shows a good, reliable time switch made with a $1.00 alarm clock.

Cut a piece of wood or fibre to fit the top part of clock, C. On this, mount contact lug A and fasten to clock with screws D D. Also mount a binding-post on the metal case of the clock. Solder



arm B to alarm key so that it will make contact with A when alarm goes off. Connect wires to A and binding-post.

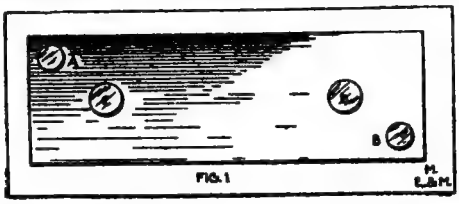
Contributed by

I. E. Cornwall.

AN EFFICIENT AND SIMPLY CONSTRUCTED CARBORUNDUM DETECTOR

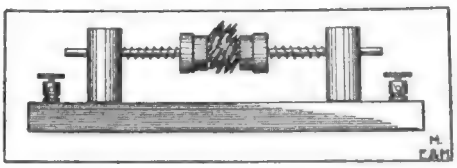
The following is a brief description on the construction of an efficient carborundum detector:

Procure some hard rubber sheeting or hard wood stock, ⅜ or ½ inch thick, and make a base 5 by 2 inches. Next, procure two binding posts with fairly large holes in them. Mount these one inch from each end with the holes facing each other as at C and D in figure 1. Then procure two binding posts from the carbons of dry batteries and mount these



at opposite corners as shown in figure 1 at A and B.

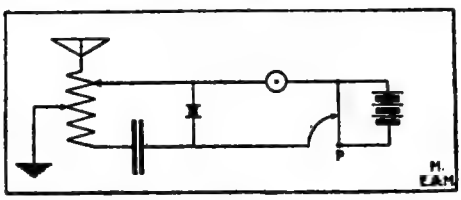
Next secure two fuse caps (those shaped like cups) and solder a brass rod in the centre of each cup. Procure some carbon rod of a size to fit in the cups and cut it into two pieces ¼ inch longer than the depth of the cups. The carbon rods should be inserted in the cups and filed off smooth.



Then slip a spring on each brass rod and slip the rods in the holes of the large binding post. Clamp a piece of carborundum between the carbon electrodes.

The connections under the base are shown in figure 2. Good carborundum has a pink tinge on the crystals.

This detector, while not as sensitive as



some others, is very reliable and does not pick up much static. It is absolutely necessary to put 2 or 3 batteries in circuit with this detector.

This type of detector is used with perfect satisfaction at the Point Judith wireless station.

Contributed by

Edwin Brown Alan.

TURN OVER

"If you do not think it possible for a loafer to get a raise, what about the baker?"

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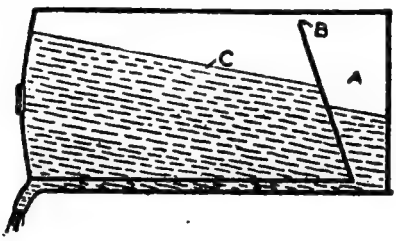
PRACTICAL HINTS

A CONTAINER WITH AUTOMATIC GAUGE

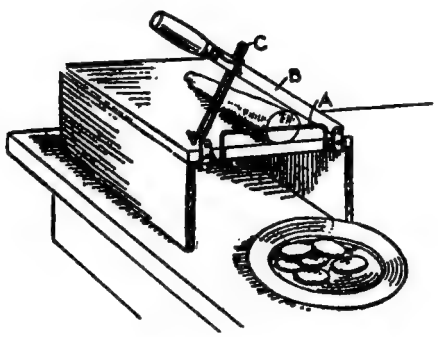
A bottle or container for pouring out a fixed quantity of its contents at differ-



ent intervals may be made as shown in the accompanying illustration. An inclined partition, B, is placed at a certain distance from the bottom depending on the amount of liquid that is to be poured out at a time. The partition is extended the entire length of the reservoir chamber, C, as shown. The action is simple—each time the bottle is placed in its normal, upright position, the liquid from chamber C fills chamber A, but is shut off from the latter when the bottle or container is tilted so as to empty A.

A SIMPLE VEGETABLE SLICER

An exceedingly simple and practical vegetable slicer may be readily made from a discarded wooden box, a knife

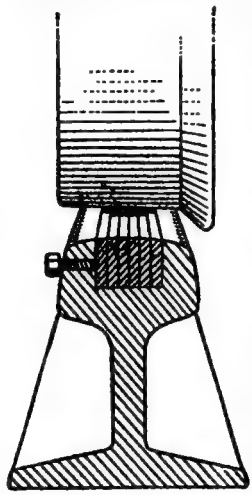


and several pieces of iron wire and iron or brass strip.

A piece of heavy iron, A, is bent as shown in the illustration and is fastened to the underside of the wooden box. Two iron or brass strips are bent in the form of angles and mounted on the box as shown; both being bored at their upper ends in order to hold a knife blade, B, and the loop of iron wire, C. The loop of wire, C, serves as a guide for the blade and is pivoted between an angle strip and a screw eye. Another loop of wire is fastened to the blade near the handle and serves to hold the former in correct position. By adjusting the iron wire guide, A, it is possible to vary the thickness of the slices.

A NEW DESIGN FOR RAILROAD RAILS

A French engineer has recently suggested a new form of rail in which the portion that is subjected to wear is composed of a number of steel strips tightly clamped together instead of having all the rail made of one solid piece of steel. The economy effected by eliminating the necessity of changing the entire rail each time the wearing surface becomes worn, as well as the lower first cost of this rail, is noteworthy.



A SIMPLE FOUNTAIN FOR THE GARDEN

An old barrel may be easily pressed into service for forming the main member of an artistic outdoor fountain, as shown in the accompanying sketch. Here the barrel is shown mounted on a suitable support and connected by the tube CC to the upright nozzle D in the center of

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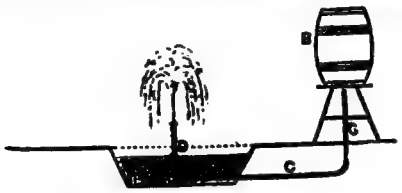
the basin A A. By covering the sides of the barrel and surrounding the nozzle

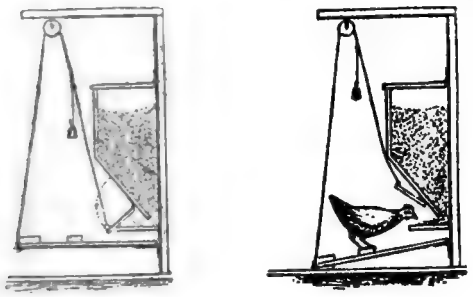


and basin with earth and plants, an artistic effect is produced.

A CHICKEN FEED HOLDER

The accompanying sketch illustrates two views of a cleverly designed chicken feed holder in which the door is automatically opened and closed.

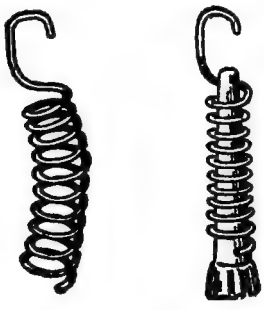
The sketches are self-explanatory. It will be noted that when a chicken steps on the hinged platform, the feed door



opens, but it immediately closes when the chicken leaves. This feature serves to preserve the feed in good condition and prevents the entry of mice or other vermin into the feed box.

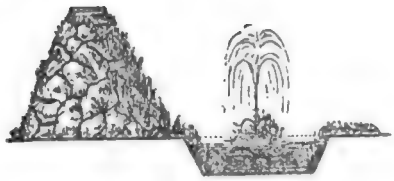
AN UMBRELLA HOLDER

For the display of open umbrellas in shops or the drying of wet umbrellas, a convenient holder may be made by winding a few turns of heavy spring wire as shown in the accompanying illustration. A hook at the top of the spring permits of hanging the umbrella from any chandelier or other fixture.



A NOVEL HOSE ATTACHMENT

By simply placing a piece of screen cloth or wire over the nozzle of a gar-

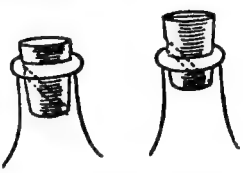


den hose as shown in the illustration, the stream of water can be converted into a fine spray. The wire cloth or netting is cut in the shape of a triangle and

wrapped around the nozzle with several turns of wire to hold it in place.

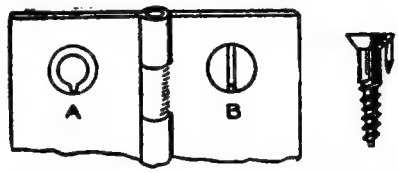
A NEW WAY OF USING A CORK

By piercing a cork diagonally as shown in the accompanying sketch it is possible to accurately pour out the contents of a bottle drop by drop. Furthermore, by pushing the cork down the bottle may be hermetically sealed.



PREVENTING HINGE SCREWS FROM TURNING

The turning and subsequent loosening of hinge screws may be prevented by



boring or filing a small hole next to and forming part of the regular countersunk screw-hole of the hinge, as shown at A in the accompanying sketch. It is then possible to drive a small nail or brad through the edge of the slot of the screw shown at B and in this manner prevent its working loose.

Contributions to this Department are welcome and will be paid for.

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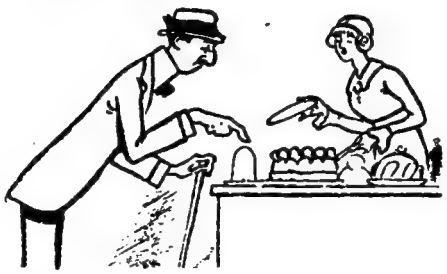
FLYING SPARKS

THIS IS FROM BOSTON

Mother (to park policeman)—My little boy wants to see the monkeys. Can you direct us to the apiary?—*Boston Transcript.*

HE SHOULD WORRY!



The Count—I wish to buy that artistic cake.

The Bakery Maid—I would advise you to take another kind, as that one is not very fresh.

The Count—That makes absolutely no difference. I am going to use it to be photographed.

And he did.—*Le Pele Mele.*

TRAPPED HER

Bobby—"Ma, you said that I shouldn't eat that piece of cake in the pantry—that it would make me sick."

Mother—"Yes, Bobby."

Bobby—(convincingly)—"But, ma, it hasn't made me sick."—*Puck.*

ENSNARED

Kitty—"Oh, Ethel, Jack has finally proposed. I knew he would."

Ethel—"Why, you said you thought he had no intention whatever of proposing."

Kitty—"Well, he didn't have."—*Boston Transcript.*

EASY

Teacher—"Is there anything you know of, children, which expands with cold and contracts with heat?"

Class (in unison)—"Yes'm. Ice."—*Baltimore American.*

PLENTY OF TIME

"Papa, I want an ice cream sundae."

"All right, dear, remind me of it again; this is only Tuesday."—*Houston Post.*

HE COULDN'T FIND IT

Chinaman—You tellee me where railroad depot?

Citizen—What's matter, John? Lost?

Chinaman—No. Me here. Depot lost.—*The Railroad and Current Mechanics.*

HOW HE GOT THEM

She—Say, how do you get your clothes, anyway?

He—Ah! I am an electrician. I get them charged.—*Russell Black.*

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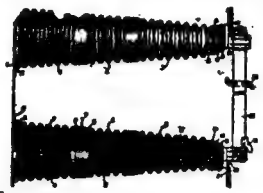
Recent Electrical Patents

1,077,126. HIGH-POTENTIAL INSULATOR. Edward M. Shumway, Schenectady, N. Y., assignor to General Electric Company, a Corporation of New York. Filed May 4, 1906. Serial No. 315,697. (Cl. 173—315.)

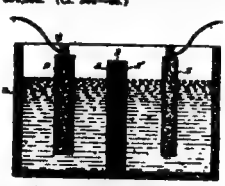


1. The combination with an insulator post, of a metallic cap having means for engaging the end of said post, and means for angularly adjusting or leveling said cap thereon.

2. The combination with an insulator post having a grooved end, of a metallic cap having a clamp for engaging the said grooved end, an adjustable means carried by said cap for angularly adjusting or leveling it with relation to the said post.

3. The combination with an insulator post, of a metallic cap having means for coupling to the end of said post, a plate on the end of said post, and means carried by the cap for engaging said plate and operating to adjust or level said cap with relation to said post.

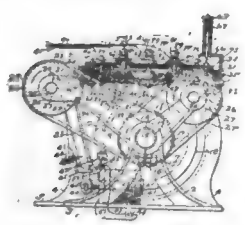
1,077,444. ELECTROLYTIC DIAPHRAGM. Herman A. Wagner, New York, N. Y. Filed May 2, 1912. Serial No. 694,306. (Cl. 204—35.)



1. In an electrolytic cell, a diaphragm comprising a porous material, metallic mercury in a finely divided state, and manganese dioxid.

2. A diaphragm comprising a porous material, in combination with metallic mercury in a finely divided state commingled therein, a finely divided metal of the palladium group, and an oxidizing agent.

1,077,561. ELECTROGRAPH. Richard S. M. Mitchell, Syracuse, N. Y., assignor, by direct and mesne assignments, to The Talking Moving Picture Co., Inc., Syracuse, N. Y., a Corporation of New York. Filed Mar. 13, 1913. Serial No. 753,886. (Cl. 181—1.)

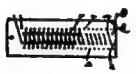


1. The combination of a frame, a rotatable drum supported by said frame, said drum having a circumferential groove and adapted to support a record, a carriage reciprocable in said frame above said drum, a transmitter supported by said carriage and having a stylus adapted to engage said record, a rocking lever carried by said frame, means for interlocking said lever with said carriage, said lever capable of being rocked by hand for lifting said carriage and transmitter away from the record and drum, for stopping the playing of the record, a magnet, said magnet having an armature connected to said lever adapted when said magnet is energized to hold said carriage in the lifted position, and a pin carried by said lever adapted to enter the groove of said drum for de-energizing said magnet for allowing said carriage to gravitate toward said drum.

1,077,192. AUTOMOBILE-LAMP. Theodore P. Dreyer, Andover, Mass. Filed Nov. 7, 1913. Serial No. 799,944. (Cl. 240—42.)

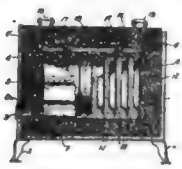
2. In a receptacle containing an electric lamp, the combination of a cup provided with a recess, a switch loosely constituted in said recess and adapted to bear against the edge of the recess as a fulcrum, and a spring adapted to press on said switch and establish contact between said contact and the base of the lamp.

1,077,286. ELECTRICAL RESISTANCE UNIT. Edward J. Ormerod, Los Angeles, Cal. Filed Mar. 3, 1911. Serial No. 612,606. Renewed May 20, 1913. Serial No. 768,894. (Cl. 219—68.)



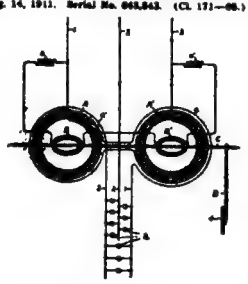
1. An electrical resistance unit including a flat insulating sheet having rows of perforations therein, the end perforations of the rows having a staggered relation to each other and being spaced from the edge of the insulating sheet to provide marginal portions of the sheet adapted to be grasped for supporting the same, and a coiled resistance element associated with the perforated insulating sheet and supported thereby, the convolutions of the resistance element passing through the perforations of the two rows and the coiled resistance element being applied to the insulating sheet by entering the same into the perforations.

1,077,307. ELECTRIC STORAGE DEVICE. Ernest Percy Ball, Pittsfield, Mass., assignor to General Electric Company, a Corporation of New York. Filed Mar. 11, 1912. Serial No. 683,804. (Cl. 219—19.)



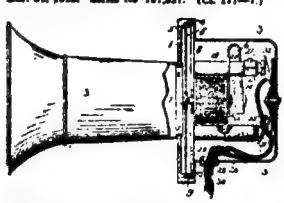
1. An electric heat storage device comprising a heat insulating receptacle, a heat storage mass therein consisting of a plurality of removable sections having high heat storage capacity and high heat conductivity and electric heating means supported independently of the said sections in good thermal conductive relation with said heat storage mass.

1,077,439. ELECTRICAL MEASURING INSTRUMENT. William H. Pratt, Lynn, Mass., assignor to General Electric Company, a Corporation of New York. Filed Aug. 14, 1911. Serial No. 643,843. (Cl. 171—68.)



1. In an electrical measuring instrument, two elements, each comprising a stationary and a movable winding, a mechanical connection between the movable windings, and auxiliary windings in inductive relation to one of the windings of each element and arranged in neutralize the effect upon said last mentioned winding of the leakage flux of the other winding of the other element respectively.

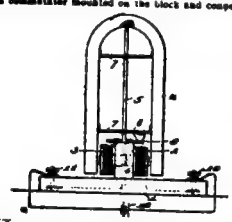
1,077,307. ELECTRIC HORN. Ralph E. Root, Cleveland, Ohio, assignor to The Adams-Bagnall Electric Company, Cleveland, Ohio, a Corporation of Ohio. Filed Mar. 31, 1913. Serial No. 757,837. (Cl. 177—7.)



1. In a horn, the combination of a base plate, a diaphragm spaced from said base plate, a post mounted upon the diaphragm and extending through an opening in the base plate, core pieces mounted upon the base plate, electric magnetic coils supported upon said pole pieces, the pole pieces extending slightly beyond the ends of the said coils, the said post which is mounted upon the diaphragm extending slightly beyond the pole pieces, a member mounted upon the pole pieces and serving to hold the coils in place, a resilient tongue carried by the said member, an armature upon the resilient tongue, said armature extending between the pole pieces, and means for regulating the movement of said tongue.

1,077,379. ELECTROMAGNETIC MOTOR. Alvin I. V Wilson, Atlanta, Ga., assignor of one-third to Clifford C. Hudson, East Point, Ga. Filed Aug. 18, 1910. Serial No. 577,796. (Cl. 172—36.)

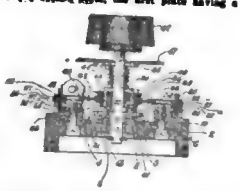
1. An electro-magnetic motor comprising a stator which consists of an electro-magnet having two poles of opposite polarity, a stationary block carrying the electro-magnet, a rod arranged centrally of the block, a U-shaped permanent magnet rotatably hung from the upper end of the rod, a commutator mounted on the block and connected to



one of the windings of the electro-magnet, and a brush carried by the permanent magnet for cooperation with the commutator.

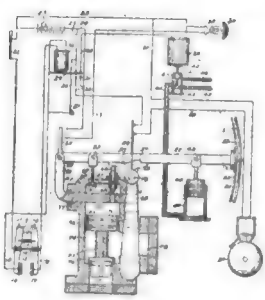
1,077,746. SNAP-SWITCH. Johann G. Peterson, Hartford, Conn. Filed Sept. 28, 1911. Serial No. 650,744. (Cl. 175—320.)

1. A switch comprising a supporting body, a plate fitted against said body and provided with a down-turned lug, the supporting body having an opening to receive said lug, a screw extending through said body and engaging said plate, a tapped plate, the first plate having a slot



and the second plate extending through said slot and having projections engaging the under surface of the first plate, and contact members carried by the second plate.

1,077,892. TRAIN-STOP. Curtis E. Stevens, Waterloo, Iowa, assignor of one-half to Otis P. Higdon, Waterloo, Iowa. Filed July 1, 1912. Serial No. 706,963. (Cl. 188—4.)



1. In combination, a chamber having a valve-seat in communication with the train-line of the air-brake apparatus of a train, a differential piston-valve in said chamber comprising differential heads connected by a stem, the valve having a longitudinal bore in communication between said valve-seat and the opposite end of the chamber, an exhaust-port to the atmosphere in said chamber intermediate said piston-heads, an exhaust-channel to the atmosphere in the end of said chamber adjacent to the larger piston-head and being of larger area than the area of the bore in said piston-valve, a valve seated removably to close said last-mentioned exhaust-channel and means for closing said exhaust-channel independently of its said exhaust-valve.

1,077,369. FUSE. Edward E. Roberts, Hartford, Conn. Filed Dec. 23, 1911. Serial No. 667,394. (Cl. 176—272.)

1. In a fuse, a casing having two passages with an opening from one to the other, a fusible member in one of the passages, a non-conducting granular filling in the last-mentioned passage, and a coarser non-conducting granular filling in the other passage, the coarser filling extending through said opening to the fusible member.

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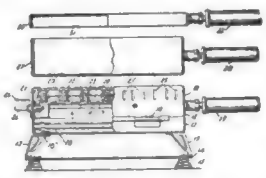
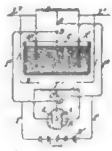
Recent Electrical Patents

1,077,886. ELECTRICALLY HEATED COOKING DEVICE. Henry Price Ball, Pittsfield, Mass., assignor to General Electric Company, a Corporation of New York. Filed June 6, 1912. Serial No. 702,472. (Cl. 219—19.)



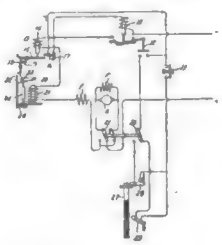
1. In an electrically heated device, the combination of a chamber having a rid spaced from the bottom thereof, an electric resistance unit constituting a portion of the upper wall of said chamber and means for supporting articles to be heated over said heating unit.

1,077,628. ELECTROLYTIC CONDENSER. Ralph D. Mershon, New York, N. Y. Filed Oct. 27, 1909, Serial No. 524,874. Renewed May 29, 1913. Serial No. 770,792. (Cl. 175—316.)



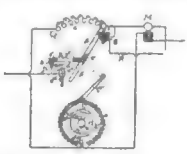
1. The combination with an electrolytic condenser, of a transformer connected to the condenser electrodes, means electrically connected with the transformer and the electrolyte to provide a unidirectional electromotive force opposing that between the electrolyte and the transformer, and an independent source of electromotive force in parallel with said means.

1,077,662. MOTOR CONTROL SYSTEM. William C. Yates, New York, N. Y., assignor to General Electric Company, a Corporation of New York. Filed July 2, 1912. Serial No. 707,149. (Cl. 172—239.)



1. The combination with an electric motor, of an overload device and means for rendering the same inoperative during the starting of the motor, and an electromagnetic device actuated by the motor current for rendering the same operative, said electromagnetic device being inactive during the starting of the motor.

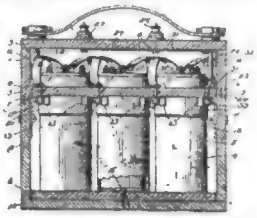
1,077,612. CONTROLLER FOR ELECTRIC MOTORS AND SIMILAR DEVICES. Harry Ward Leonard, Bronxville, N. Y. Original application filed July 11, 1903, Serial No. 165,061. Divided and this application filed May 17, 1907, Serial No. 374,179. Renewed July 22, 1909. Serial No. 509,063. (Cl. 172—179.)



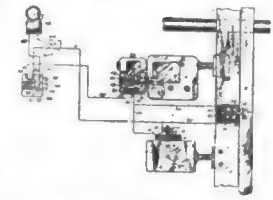
1. The combination with a motor having a shunt field winding, a rheostat in series with said field winding, an additional starting rheostat means tending to move the contact arm thereof toward the initial position and which arm is designed to be held in its final position, an automatic release for said arm which responds when the supply voltage falls below a certain amount, the movement of said contact arm toward the initial position also causing the movement of the arm of said rheostat in series with the field winding toward the resistance all out position.

1,076,927. BATTERY HOLDER. George N. Watrous, Jr., Washington, D. C. Filed Dec. 7, 1912. Serial No. 735,299. (Cl. 204—35.)

1. A holder for dry cell electric batteries comprising a casing, said casing having a body portion and a removable top, a cage provided with means for receiving dry cell electric batteries, said cage being permanently secured to the body portion of the said casing, means on said cage for effecting electrical connections with said dry cell electric batteries, a pair of electrical spring contacts arranged on said cage and permanently connected thereto a pair of electrical contact pieces on said top of said casing and permanently attached thereto, said electrical contacts-pieces having lateral flanges at their lower ends, to engage and connect with said pair of electrical contacts on said cage when said top is applied to the body portion of the casing, suitable binding posts on said top and electrical connections between the said contact pieces on said top and the said binding posts, the whole arranged in such manner that the said electric dry cells are connected to the said binding posts when the said removable top is in position on the body of the casing and the electrical connection between the said electric dry cells and the said binding posts is broken when the said removable top is removed from the body of the casing.

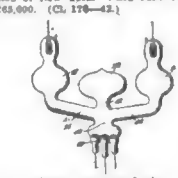


1,077,077. ELECTRIC PROTECTIVE DEVICE FOR SAFE AND VAULT DOORS. Hermann Hubn and Henry R. Hubn, Macon, Ga., assignors to The Yale & Towne Manufacturing Company, Stamford, Conn. Filed Oct. 22, 1912. Serial No. 727,196. (Cl. 161—38.)



1. The combination with a time-lock mechanism and electrically controlled protective devices, of a timing controller for the circuits of said protective devices connected with and controlled by the time lock mechanism, whereby the operation of the protective devices may be rendered inoperative for a predetermined period after the time-lock mechanism has been set.

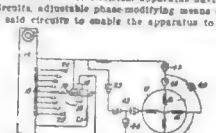
1,076,872. VAPOR-RECTIFIER FOR HIGH POTENTIAL CIRCUITS. Joseph Le Roy Hayden, Schenectady, N. Y., assignor to General Electric Company, a Corporation of New York. Filed June 14, 1906. Serial No. 321,900. (Cl. 176—42.)



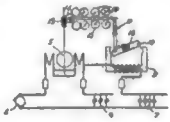
1. A vapor electric apparatus having a cathode and a plurality of solid anodes, separate tubes for said anodes, and separate condensing chambers connected to said tubes and located directly in the path of rays to said cathode.

1,077,826. ALTERNATING-CURRENT APPARATUS. Ralph D. Mershon, New York, N. Y. Filed Apr. 27, 1910. Serial No. 557,900. Renewed May 24, 1912. Serial No. 709,767. (Cl. 172—233.)

1. The combination of electrical apparatus having polyphase circuits, adjustable phase-modifying means connected with said circuits to enable the apparatus to operate on a single phase circuit, and automatic means for adjusting said phase-modifying means to maintain a given phase-relation in the polyphase circuits of the apparatus.



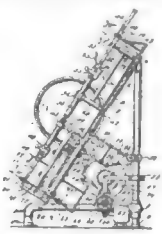
1,077,788. SYSTEM OF ELECTRIC METERING. Karl Markau, Berlin, Germany, assignor to General Electric Company, a Corporation of New York. Filed July 23, 1912. Serial No. 711,068. (Cl. 171—306.)



1. A system of metering electrical energy comprising a meter having a register dial, a plurality of sets of electric transmitting devices, and means for recording on said dial the total energy consumed in all of said sets of transmitting devices only during the times that energy is being consumed in one particular set of said transmitting devices.

1,077,308. ELECTRIC FOG SIGNAL LIGHT. Roy C. Douglas, San Francisco, Cal. Filed Oct. 24, 1912. Serial No. 727,563. (Cl. 177—346.)

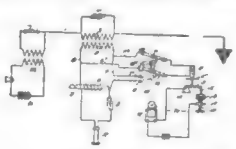
1. A fog signal light comprising a supporting frame, a stationary electrode support secured thereto, a stationary electrode holder having an adjustable engagement with said support, a stationary electrode carried by said holder,



a feeding mechanism connected with said holder, a movable electrode carried slidably mounted on said frame, a movable electrode secured to said carrier, a gripping and releasing device engaged with said movable electrode carrier, and an operating mechanism connected with said gripping device whereby the latter is actuated to retract said carrier and the electrode thereon.

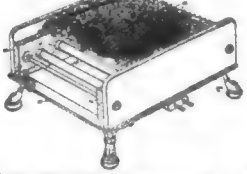
1,076,900. TELEPHONE SYSTEM. Charles W. Mcdonald, Algona, Wash., assignor to Globe Telephone Company, Seattle, Wash., a Corporation of Washington. Filed July 15, 1912. Serial No. 709,469. (Cl. 178—18.)

1. In a telephone system, the combination with the main line embracing the primary coil of a transformer, a normally incomplete circuit embracing the secondary coil of said transformer, and a telephone receiver and a condenser on said circuit, of a normally incomplete relay circuit, a signal instrument in the latter, a shunt circuit embracing the magnet of a high resistance telephone receiver, a diaphragm for this receiver, a closure for the opening in



said relay circuit, operatively connected with said diaphragm, a switch adapted to be selectively employed for closing said incomplete circuit or for conductively connecting said relay circuit with the first named circuit.

1,076,858. ELECTRIC HEATER. William S. Andrews, Schenectady, N. Y., assignor to General Electric Company, a Corporation of New York. Filed June 13, 1908. Serial No. 438,101. (Cl. 219—63.)



1. In an electric heater, the combination of a quartz covering, and a continuous metallic heating resistance of greater length than said covering located inside the same and having a melting point lower than the melting point of said covering whereby said resistance may be raised to a temperature above its glowing point without endangering said covering, substantially as described.

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BOOK REVIEWS

Any book reviewed in these columns may be secured through our Book Department.

WIRELESS TELEGRAPHY AND TELEPHONY

Under the title of "Wireless Telegraphy and Telephony,"* Mr. Charles R. Gibson has prepared an interesting book on the subject of radio telegraphy and telephony from the viewpoint of furnishing an average layman with popular information on the past and present of this most interesting subject.

The book is written so that the reader does not necessarily have to possess a previous knowledge of the subject, while on the other hand the reader that is well versed in radio communication will find a mass of new information that will be of no little interest and service to him. A few of the titles of the chapters that serve to convey a general idea as to the contents of the book are: "The Mysterious Ether of Space," "Some Fundamental Principles," "Early Proposals and Experiments," "The Advent of True Wireless Telegraphy, 1888-1894," "The Advent of Marconi," "The Bridging of the Atlantic," "Other Systems," "General Principles of Telephony" and "Telephoning Without Wires." In order to facilitate the study of the history of radio telegraphy, a chapter entitled "The Evolution and Development of Wireless Telegraphy" is devoted to briefly summarizing the important steps in the art, beginning with Michael Faraday's discovery of electro-magnetic induction between two entirely separate circuits and terminating with the decision of the British Government in 1913 to have an Imperial wireless chain, arranged in chronological order. Another valuable feature is a glossary of terms to facilitate the mastering of various descriptions by the beginner in wireless telegraphy.

The book is handsomely printed on highly coated paper. The type throughout is very large and easily read. The many half-tone illustrations are exceedingly timely, while the diagrams are clear and readily understood.

* *Wireless Telegraphy and Telephony*, by Charles R. Gibson, F.R.S.E. Published by J. B. Lippincott Company, Washington Square, Philadelphia, Pa. Contains 19 illustrations and diagrams, as well as a number of full page plates. Cloth bound. 156 pages. Price, $1.00.

LOOSE LEAF ENGINEERING INFORMATION

The constantly growing and expanding field of engineering in all its branches necessitates the expenditure of more and more time on the part of the engineer seeking data. Although there are almost numberless articles published monthly, even weekly, in the technical press, there are but few engineers that can spare the time required to gather such articles and then read them. It is the demand for condensed and readily accessible data that has caused the publication of loose leaf sheets known as "Lefax."*

"Lefax" are loose leaf sheets published monthly and containing engineering data carefully prepared by authorities in various fields. These sheets can be carried in a loose leaf pocket-book or filed in cloth-covered telescoping boxes capable of holding 1,000 sheets. Among the branches of engineering covered by "Lefax" are: General, Civil and Military, Mechanical, Electrical, Chemical, Mining, Architecture, Railway, Marine and Naval, and Social. "Lefax" are subscribed for by the year, being sent monthly when they are published. The system is a highly commendable one and is advocated and employed by many of the leading engineers.

* *Lefax*, edited by John Clinton Parker, Member A.S.M.E. Published by the Standard Corporation, Penna. Bldg., Philadelphia, Pa. Subscription rate, $3.00 per year, which comprises a service of 16 sheets per month, on any subject selected. Single sheets: subscribers 2c; non-subscribers 5c; pocket books 90c; filing boxes, including 10 division cards, 75c each.

HOW TO MAKE THINGS ELECTRICAL

At the present time when Young America evidently cannot read enough literature on the construction of various electrical devices that may be made with the tools and materials usually available about the home, the book, "How to Make Things Electrical,"* is indeed most timely.

This work has been primarily published for the experimenters and students who desire to build their own electrical apparatus. All the building operations have been rendered as simple as possible and only in a very few instances are the services of a lathe necessary. In all directions on the construction of electrical apparatus good working drawings are essential and in this respect "How to Make Things Electrical" is greatly enhanced by clear and well executed illustrations. This work is a commendable one for anybody desiring to construct simple electrical apparatus of all kinds.

* *How to Make Things Electrical*, published by Popular Electricity Publishing Company, 350 N. Clark Street, Chicago, Ill. Contains 200 pages and 184 illustrations. Cloth bound. Price, $1.00.

A HANDBOOK FOR WIRELESS OPERATORS

Under the title of "Handbook of Technical Instruction for Wireless Telegraphists,"* Mr. J. C. Hawkhead has prepared a most interesting work on the practical theory and operation of standard wireless equipment, especially written for the wireless operator. The work is divided into three main parts to facilitate the locating of different information. The first part contains such chapters as "Preliminary Considerations," "Primary Cells,"

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"Accumulators," "Current Electricity, Its Laws and Units," "Magnetism," "Dynamo, Motor, Rotary Converter," "Inductance" and "Direct and Alternating Current Measurements." The second part contains but two chapters—"Electro-magnetic Waves" and "The Receiving Circuit." The third part is divided into five chapters, viz.: "The 1½ K.W. Set," "The Aerial," "The 5 K.W. Set," "Small Power Sets" and "Faults."

Every instrument used in practical radio communication is illustrated with both assembled and sectional views. The details of all the instruments are quite complete. It must be stated, however, that the book is wholly confined to Marconi wireless equipment and is therefore of particular value to Marconi station operators.

* *Handbook of Technical Instruction for Wireless Telegraphists*, by J. C. Hawkhead. Published by The Marconi Press Agency, Limited, Marconi House, Strand, London, W. C., England. Contains 170 diagrams aside from a large number of half-tone plates of wireless apparatus and stations. Cloth bound, 295 pages.

EXPERIMENTAL WIRELESS STATIONS

In the new 1914 revised edition of "Experimental Wireless Stations"* the author has made several changes that, although of inconsiderable importance when taken singly, have served to greatly enhance the value of the new edition.

"Experimental Wireless Stations," as its name implies, is primarily intended for the amateur. One of the main objects of the book is to provide a standard for amateur stations in preference to the many varieties of more or less successful systems and instruments that are either made or purchased by the amateur. The book contains exactly the information that the experimenter desires—a feature that is sadly lacking in most works now available that cover too extensively the history, theory and commercial apparatus to the almost complete exclusion of amateur stations and instruments.

The constructional data contained in this book is unusually complete and invaluable to the average amateur. One of the most noteworthy features in this respect is a table of transformer data for the construction of closed core types from 100 to 2000 watts. Another table is also included for the making of spark coils from ¼ inch to 10 inches. All the various instruments comprising a transmitting and receiving set are described in detail.

* *Experimental Wireless Stations*, new 1914 edition, by Philip E. Edelman. Published by Philip Edelman, 2484 Lyndale South, Minneapolis, Minn. Contains 224 pages, profusely illustrated. Cloth bound. Price, postpaid, $2.00.

HARPER'S WIRELESS BOOK

Books dealing with the theory of wireless telegraphy are plentiful. The average wireless amateur finds considerable information in such works that is of value to him, but it often happens that no little amount of the contents of such a book is vague and uninteresting. What the wireless amateur most needs and for which there is a steadily growing demand is a book that is simply written and also describes the making of various wireless instruments as well as the erection of the aerial, installation of the station, operation of the apparatus, and other practical information.

"Harper's Wireless Book"* is just such a work, since its 185 pages are devoted to simple explanations of the working of various apparatus, the theory and history of radio telegraphy and directions for the construction of simple instruments as well as their installation and manipulation. While it is a work that can be highly recommended to the beginner in wireless because of its simple explanations and instructions for making various instruments, it is also a very good reference book for even the advanced amateur that desires to understand the principles and to possess a general knowledge in the art. The new wireless laws are also discussed in simple language and in such a manner that the reader can immediately grasp exactly the information he desires to know. "Harper's Wireless Book" will form a valuable addition to any library, irrespective of its previous completeness.

* *Harper's Wireless Book*, by A. H. Verrill. Published by Harper & Bros., Franklin Square, New York City. Contains 185 pages and is profusely illustrated with sketches and plates. Cloth bound. Price, $1.00.

NEW GOVERNMENT PUBLICATIONS

Among the most recent Government publications are the following, just issued by the Bureau of Mines:

BULLETINS.

BULLETIN 69. Coal-mine accidents in the United States and in foreign countries, by F. W. Horton. 1913. 101 pp., 3 pls., 40 figs.

BULLETIN 71. Fuller's earth, by C. L. Parsons. 1913. 38 pp.

TECHNICAL PAPERS.

TECHNICAL PAPER 30. Accident prevention at Lake Superior iron mines, by D. E. Woodbridge. 1913. 34 pp., 7 figs.

TECHNICAL PAPER 51. Possible causes of the decline of oil wells, and suggested methods of prolonging yield, by L. G. Huntley. 1913. 32 pp., 9 figs.

TECHNICAL PAPER 60. The approximate melting points of some commercial copper alloys, by H. W. Gillett and A. B. Norton. 1913. 9 pp.

MINERS' CIRCULAR.

MINERS' CIRCULAR 13. Safety in tunneling, by D. W. Brunton and J. A. Davis. 1913. 19 pp.

The Bureau of Mines has copies of these publications for free distribution, but cannot give more than one copy of the same bulletin to one person. Requests for all papers cannot be granted without satisfactory reason. In asking for publications, the number and title should be stated.

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NEW THINGS

Electrical—Wireless—Mechanical

HIGH GRADE SWISS FILES

Montgomery & Co., 105-107 Fulton Street, New York City, have just issued a new combined catalogue and price list of Grobet Swiss Files in which a considerable reduction over the prices quoted heretofore is noted. Grobet files represent the experience of over 100 years in the making of the highest grade files. These files have won an enviable reputation and are recognized as the best in this class of tools. Although Grobet files are not cheap in the sense of price, they will outlast many cheap files and will render better service, thus proving far more economical in the end. Files in every shape and size as well as for every possible purpose are illustrated in the catalogue, and anyone interested in using nothing but the best of tools will do well to write for a copy of this catalogue.

BELL RINGERS AND TOY TRANSFORMERS

Anyone interested in using a Bell Ringing Transformer in place of batteries will find the bulletin No. 2 issued by the Viking Electric Company, Department C, 150 Chambers street, New York, exceedingly interesting. It describes some of the products manufactured by that firm, and contains considerable information and data on wiring and installing bell circuits. This firm has developed a special transformer known as type "EW" especially suited for residences and office equipments.

Aside from bell ringing transformers, this concern also manufactures a line of toy transformers in several capacities. These transformers are sold at a reasonable price and will prove far more economical in operation than dry cells or wet batteries to anyone having access to alternating current power circuits.

Catalogs, prices, and other information will be sent to anyone addressing the company direct.

IMPROVED WIRELESS APPARATUS

In an attractive folder that will be sent to anyone on request, Mr. J. F. Arnold of 243 East 118th Street, New York City, has illustrated and described his line of wireless instruments.

Among the instruments manufactured by him is a loose coupler of exceedingly neat and efficient design. The woodwork is highly polished mahogany throughout. The primary and secondary are wound with green silk-covered wire. All the metal parts are nickel plated. The secondary has 11 taps connected to switch points which form part of a switch of special design. The slider on the primary insures a perfect contact at all times and slides easily.

Complete receiving sets, complete sending sets, detectors, fixed and variable condensers, machined parts and other wireless goods are listed in the folder.

A REMARKABLE SAW

The recent remarkable record made by Charles Nadolney, an expert carpenter of Nanticoke, Pa., with a Disston saw over eleven years old has attracted considerable attention. The local union to which he belongs, No. 414, conducted a sawing contest with the object of seeing who could make the squarest cut without any guide and within two and a half minutes on a hemlock beam measuring 6 by 8 inches. The prize was a set of Disston saws. Mr. Nadolney entered with his well-tried and considerably worn favorite, completing his cut well within the time limit and so accurately that there was only 1/32 inch variation through the eight inches of the beam. No other contestant did nearly as well. The result of the contest is another proof of the excellent quality of Disston saws.

Literature and prices on Disston tools may be procured by addressing Henry Disston & Sons, Inc., Philadelphia, Pa.

A LINE OF ELECTRICAL APPARATUS

In a 102-page catalogue the Holtzer-Cabot Electric Company of Brookline, Mass., has thoroughly illustrated and described its large line of electrical apparatus of all kinds.

Among the products made by the firm are: Interior telephones of both the desk and wall types as well as hand microtelephones; telephone instrument parts; annunciators and signalling systems; bells, buzzers and push buttons in a wide variety of designs; fire alarm stations; magneto clocks and watchman's systems; magnetos for marine, stationary and automobile engines; electric horns for automobiles and motor boats; copper cable terminals; carbureters; electric lighting systems for motor cars and boats; commercial telephone apparatus and portable testing sets for linemen; wire connectors; central telephone station equipment and wireless receivers. The descriptions of all the products are thorough and are greatly enhanced by excellent illustrations.

The wireless receivers are made in two resistances—2,000 and 3,000 ohms per pair. The shells of the receivers are made of

(*Continued on page* 82)

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THE EDITOR'S DESK

This issue marks the initial appearance of the consolidated magazine MODERN ELECTRICS AND MECHANICS. It has been carefully prepared so as to incorporate all of the most interesting features of its predecessors, *Modern Electrics* and *Electrician and Mechanic*—a task that was by no means simple, but we feel quite satisfied that it has been accomplished. Thus, in this issue will be found articles on wireless telegraphy, on chemistry, on new mechanical inventions, on producer gas engines, on electrical progress, on wood-working, and all of the regular departments such as the Experimental Department, Patent Department, Questions and Answers Department, Wireless Contest Department, Practical Hints, Apparatus Exchange, and others. There are numerous articles on the making of different things, such as wireless instruments, furniture, mechanical objects, and electrical devices, for MODERN ELECTRICS AND MECHANICS will publish each month a number of articles on the construction of different practical things. Still another feature is the article in this issue on nails and rivets. This article is the first of a series that will be published regularly dealing with the manufacturing of different extensively used commodities. A passing word might be given to the new cover as well as the simplified and improved headings and typographical arrangement throughout this issue. In conclusion, if MODERN ELECTRICS AND MECHANICS pleases you, tell all your friends—if it does not, tell us.

In another part of this issue attention is directed to the two fires at sea in which the wireless played no small rôle. One of these occurred on the Spanish steamer "Balmes" and the incident resembles in no little degree that which befell the ill-fated "Volturno" a short while before. The other occurred on the "Berkshire" and a rescue was also effected by means of wireless.

Many readers have written in asking whether they should procure a license for operating their receiving sets. This question has been answered many times before, but we will answer it again. In every instance the correspondent sends in a clipping from a newspaper or magazine stating that a wireless amateur has been arrested for receiving messages without a license. It is highly probable that these clippings misstate the real facts—quite a usual occurrence in magazines and newspapers that are not devoted to technical subjects. Once more let it be known that anyone, anywhere and everywhere in the United States can receive wireless messages with a receiving set without a license. But—and this is the important part of it—anyone receiving a radio communication not intended for him cannot divulge its contents to another party under penalty of a fine or imprisonment. For sending, of course, the law applies more thoroughly, but inasmuch as the question does not pertain to sending, it will not be discussed here.

Among the many good things in the February issue will be an article on explosives. Do you know what dynamite is or how it is used? Do you know how electricity plays a part in the firing of blasts? If you do not know, read the article and learn; if you do know, read the article and learn more than you know at present. Explosives are today used for many purposes, ranging from the firing of cannons and the spreading of devastation when used in shells, mines or torpedoes, to the blasting of railroad cuts through mountains, breaking huge pieces of granite in quarries, loosening coal in mines, shattering ice jams, and last, but by no means least, for agricultural purposes, in which dynamite blasts stir up the earth and loosen it so that seeds can grow more readily and become robust plants. Quite a contrast with the damage to property and loss of lives occasioned by the bursting of a huge shell in modern warfare, isn't it? Still, it is an explosive that is used for both. But why tell you more? The story of explosives will be a pleasant surprise to all readers. Watch for it!

Wireless articles? Well, the February issue is going to have one of the finest collections of wireless articles that was ever published. There are going to be several of these devoted to the construction of new apparatus and the remaining ones dealing with new wireless inventions, reminiscences of the pioneer days of the art and other topics pertaining to radio communication.

It goes without saying that there will be several articles on mechanical subjects as well as wood-working. Also all of the departments will appear, for these are regular features that are always with us.

The story in this issue, "Via Wireless," is unusually interesting and it is surrounded by a real wireless atmosphere. It is out of the ordinary as far as wireless stories go.

And, in conclusion, MODERN ELECTRICS AND MECHANICS takes this opportunity of wishing you a Happy New Year—one that will bring prosperity and happiness to all of us.

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Via Wireless

By David A. Wasson

(Copyrighted by the Frank A. Munsey Co.)

THAT Frederick Ayre was wireless operator of the steamship *Talaria* at the age of nineteen doesn't mean necessarily that he was a prodigy. There are many such youngsters at the keys on many such craft along our coasts.

Most of them, like Freddy, served their apprenticeships on the home-made apparatus that stretched its flimsy antennae between house and barn down in Jayport, or thereabout. And, although there is a fine, distinguished sound to the title, it is not a gold-mine as regards either salary or prestige aboard ship.

Moreover, the *Talaria* was only a non-passenger-carrying freighter of some sixteen hundred tons register, and didn't come within the provisions of the Wireless Act.

Freddy had emerged triumphant from a bout with the Federal authorities, which had come about after he, like many another enterprising amateur, had beautifully tangled up a few of the government's important official messages.

He emerged with a highly inflated opinion of his own prowess, and took the *Talaria* job which the notoriety brought him merely as a makeshift till something decent in his line turned up, as he explained.

He took the job heedless of the tears of an overindulgent mother who had mapped out for him a brilliant career ashore; heedful, instead, of the plaudits of admiring Jayporters.

Freddy was, as may be imagined, something of a spoiled young man; but he was smart—smart as a steel trap, all Jayport said. And few could have doubted it who saw him take the boat for the metropolis and the *Talaria* on that memorable morning.

From the two inches of freshly shaved florid neck above his celluloid collar to the new pasteboard suit-case waiting at his feet his outfit spelled alertness and prosperity and monumental success.

For three uneventful trips now Freddy had reigned supreme in the little wireless coop which had been knocked up on the *Talaria's* hurricane-deck just aft of the mainmast.

Not grizzled Captain Helme himself swelled more under his double-breasted reefer than Freddy when first he imparted to an anxious world the momentous news that the *Talaria,* New York for San Juan, was three hundred and sixty-four miles south of Scotland Lightship at noon of the seventh; relayed from the thousand-mile-away Cunarder *Melancholia* a love-sick passenger's amorous greeting to the girl he left behind him; or swapped aimless flippancies with unseen brethren over the sea-rim.

But routine ever palls on buoyant youth, and after three aforesaid trips Freddy's ambition yawned and stretched itself again. He could see no reason why Binns of the *Republic,* Bride of the *Titanic,* Cottam of the *Carpathia,* and Ginsberg of the *Trent* should monopolize the glory of the wireless fraternity.

He had so repeatedly assured everyone from the quartermasters up that he was too big for his position that they told him, instead, he was too big for his hat, and privately set him down for a bumptious young upstart.

Aggressiveness and greatness usually go hand in hand, however, and Freddy was to achieve greatness—of a sort. His chance to be a hero came about thusly:

One evening, just after the second mate had got the running lights to winking, Freddy climbed the steep stairs to his aerie, urging the last of his repast to its destiny with not over-clean fingers.

He lit a cigarette and sat down to his instrument prepared to advise the Hydrographic Office at Washington that the "S.S. *Talaria,* Baltimore for Trapani, had passed at 5 P. M. Thursday, N. lat. 40 degrees 22 minutes, W. lon. 49 degrees 25 minutes, a small berg surrounded by slush."

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He threw over the rheostat, and wound up and tested his magnetic detector. As he threw on the converter there was a shrilling hum and whir that told of the generation of current for the slender aerial.

He put the receiver to his ears and tuned into the wave-length of some one who was talking near by.

". . . with derelict French bark Latour d'Auvergne," this somebody's Morse was saying. "Am sinking . . ."

"Great guns! collided with a derelict and is sinking!" gasped Freddy, and blue fire crackled across the spark-gap as he cut in in frantic interruption.

"Got you. Who's talking?"

"S. S. *Leviathan,* N. lat. 40 degrees 21 minutes, W. lon. 49 degrees 6 minutes," was the answer.

"Right-o! Get your crew in boats. *Talaria,* coming," assured Freddy, pumping the key as for dear life. He shut off the generator, switched off mains, upset a chair in his exit, and dodged yawning cowls and fat-bellied lifeboats as he raced forward along the hurricane deck.

Captain Helme, seated at the polished table in the chart room, suddenly found himself staring at a yellow aerogram blank covered with hieroglyphics, instead of the month's pilot chart of the North Atlantic, and listening in amazement to the incoherencies of an excited and breathless youth.

"That's her position, cap'n!" he panted, and pointed at the blank. "Can't be far from us! Crew's taken to the boats, but I told 'em we're coming!"

"Who? What?" demanded the captain, removing his glasses.

"The *Leviathan!* Struck a derelict! I just got her S O S!" gasped Freddy, and then, as visions arose of the fame that would be his, asked hopefully: "What is she? Big Blue Anchor liner, ain't she?"

"No," said the skipper, as he arose hastily with the blank. "Old, low-powered tramp—Englishman—Tampa for Genoa with timber—coaled at Norfolk and sailed twelve hours ahead of us. She's only twenty miles or so ahead now, according to the position she gives you. Lucky for her she's on the same course we are. Good boy, 'Wireless'!"

And the captain was making for the bridge stairs, leaving Wireless Operator Frederick Ayre in a mood in which complacency struggled with disappointment.

Presently the *Talaria's* decks began to quake and throb as Captain Helme indicated "full speed ahead" on the engine room telegraph. Her ponderous screw hurried its pulsing revolutions from thirty-eight to forty-four per minute, and her speed climbed from seven to nine knots an hour. Not an inspiring gait; but the *Talaria* wasn't built to break records, and the only one she broke was her own.

In spite of it, the luminous breaker that pushed and seethed ahead of her bluff bow grew nobly in size and frothiness, and smoke belched from her salt-stained funnel till it blotted stars and made night blacker astern.

"Keep tabs on the poor fellows, Wireless," ordered the captain, and Freddy shot the unfortunate another question.

"Hello, *Leviathan;* how's the wreck?" he asked.

"Just blown up forward. Look out for floating wreckage when you come along," the reply came through the night.

The imaginative Freddy, envying the unknown operator's coolness at such a time, went forward and reported to Captain Helme that an explosion of air under the sinking *Leviathan's* forecastle deck had occurred, and that he had received a last desperate call for help.

Whereat good old Captain Helme, in great agitation, bellowed a message down the speaking-tube to the engine-room that broke the United States inspector's restrictions as to boiler pressure into smithereens, and the valiant *Talaria* boosted her gait another knot.

Probably Wireless Operator Frederick Ayre was the only person aboard the *Talaria* who regretted that the night was not one for a dramatic rescue; one such as might be afforded by a screaming, smothering blizzard with licking, galloping crests that knocked oars skyward from gunwales and

(*Continued on page* 94)

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Wireless Telegraph Contest

The Wireless Station and Laboratory contest is a regular monthly feature. The best photograph submitted each month is awarded a first prize of Three Dollars; second best, Two Dollars; third best, One Dollar.

The description of a station should not exceed 250 words. Write on one side of the paper only, using as many separate sheets as are necessary. Descriptions should be written in ink—not pencil. Typewritten descriptions using double spacing are preferable to any. It is advisable to send two prints of the photograph whenever possible—one toned dark and the other light—in order to permit of choosing the one best adapted for reproduction. Prints should be sharp and distinct.

This competition is open to all, irrespective of whether they are subscribers or not.

FIRST PRIZE

I am submitting a flashlight photograph of my station.

The height of my antenna is 60

WIRELESS STATION OF CREAH V. WILLIAMS

feet and the length 80 feet. I use the inverted L type with four strands of No. 14 wire on nine foot spreaders.

For receiving I use a three slide autotransformer, 25 plate rotary variable condenser, fixed condenser, Poulson tikker, galena, silicon and iron pyrites detectors, loading coil, buzzer test, 3000 ohm phones, and required switches. The wave-length is 200 meters. With this set I have picked up messages 900 to 1000 miles distant under normal conditions.

For sending I employ a two-inch spark coil, six plate series condenser, two leyden jars, sending helix, rotary and stationary gaps, microphone transmitter and key. I made most of these instruments with the assistance of this magazine. My call is 6.W.V. I would like to communicate with any one within my reach.—*Creah V. Williams, San Jose, Cal.*

SECOND PRIZE

My instruments are practically all home made. The sending set consists of one-half inch coil, two 8 by 10 tinfoiled glass plates in connection with a

WIRELESS STATION OF EMIL DE NEUF

helix and a spark gap. The coil is run on a 6 volt 60 ampere storage battery and I can cover a distance of 8 to 10 miles at any time. An ordinary wireless key is used.

The receiving side consists of a 2,000 meter loose coupler-tuner, galena de-

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tector, fixed and variable condensers, and a pair of Murdock phones. The antenna switch is of my own make and is a three blade type. In connection with my set I have a Poulsen Tikker with the necessary loading coils.

My antenna is only 30 feet high and consists of two wires 240 feet long. I get very good results with my set. I hear Honolulu, 2,100 miles, and all Pacific Coast stations.—*Emil de Neuf, Jr., Berkeley, Cal.*

THIRD PRIZE

I am submitting herewith a photograph and description of my wireless station to the wireless contest.

My aerial is composed of six strands of No. 14 copper wire 220 feet long. It is sixty feet high at one end and slants down to forty feet, with the lead-in at the lower end.

The receiving set consists of: Loose coupler, rotary, variable condenser, fixed condenser, silicon and galena detectors made interchangeable by a pole changing switch, and a pair of Murdock 3,000 ohm phones.

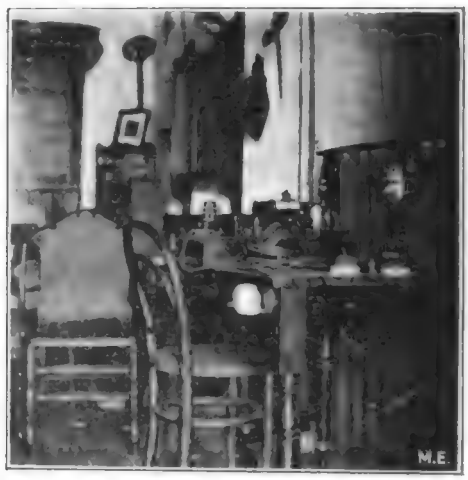
WIRELESS STATION OF W. C. SLOAT

Sending: One-inch spark coil with suitable leyden jar, rotary spark gap, and oscillation transformer such as described in a recent number of this magazine, key and necessary switches.

Everything in this set was constructed by myself except the phones.—*W. C. Sloat, Springfield, Mass.*

HONORABLE MENTION

Enclosed please find photograph of my wireless station which I wish to enter in your monthly contest.



WIRELESS STATION OF CHARLES JACKSON

The instruments from left to right are: Loose coupler, polished cabinet on which are mounted a Murdock variable condenser, a "cat whisker" detector in which I use iron pyrites and silicon, a fixed condenser, phone plugs, ebonite shorting switch for the detector and a small knife switch for the "buzzer test."

On the table is a 2,000 ohm Western Electric head set. On the back of table is a D. P. D. T. antenna switch, a 25 ampere S. P. S. T. knife switch for grounding aerial and a zinc spark gap.

On the shelf, just visible in the illustration, is an oscillation transformer and under transformer a glass plate condenser in oil. On the right hand side of table are a motor ignition coil for transmitting, and a 6 volt, 40 ampere hour accumulator, and on the corner of the table a key with very large platinum contacts. I also have a double slide tuner for use with receiver.

My aerial is composed of two No. 16 copper wires on 12 foot spreaders, 150 feet long on two 60 foot masts.

With this set I can easily hear New Zealand, 1,200 miles, also all commercial stations within 1,000 miles.

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OUR NEW BIG 325 PP. ELECTRICAL AND WIRELESS CATALOG is Creating a Sensation

READ WHAT SOME OF OUR PATRONS SAY ABOUT IT

What Catalog Contains:

125 pp. Wireless Instruments for commercial use.
(Wireless section four times as large as many Wireless catalogs. Contains over thirty diagrams and complete instructions for erecting aerial and operating all combinations of wireless instruments.)

A patron in India writes:—"Many thanks for your beautiful and educational catalog. It does you much credit and indeed is fit for the table of a king. It is an exquisite production"

What Catalog Contains:

12 pp. Miniature Lamps.
4 pp. Electric Lighting Plants.
10 pp. Ammeters & Voltmeters.
6 pp. Launch Lighting Outfits.
5 pp. Shot Guns, Rifles, etc.

ANYTHING ELECTRICAL OR WIRELESS AT LOWEST PRICES

10 pp. Wireless Raw Material.
8 pp. Transformers.
5 pp. Storage Batteries.
15 pp. Telegraph Instruments.
35 pp. Commercial and Toy Motors.
5 pp. Massage Vibrators.
7 pp. Flash Lights.

Another patron writes:—"I am greatly pleased with your new edition; it is truly a work of art in the catalog line."

Here is what another patron says:—"It appears to me that you have incorporated in your catalog the cream of all other catalogs combined."

8 pp. Pocket Knives
12 pp. Victrolas.
12 pp. Radiopticons.
18 pp. Miniature Railways.
22 pp. Electrical and Mechanical Books.

Another patron says:—"It is certainly well gotten up, and any one interested in 'Anything Electrical' should have it."

A gentleman in the West says:—"Just received your superb catalog. It is better than a $10.00 text book."

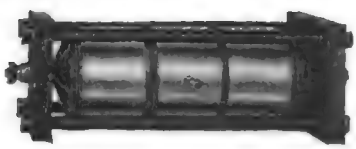
We print only a few of the many letters we have received during the past six weeks. We have equally enthusiastic letters concerning our low prices and the high quality of our goods.

This catalog will be mailed you upon receipt of 6c. stamps or coin

which you may deduct on your first order of $1.00. Not sent otherwise.

Great cost of catalog and low prices prohibit distribution except to those really interested.

THE LATEST WIRELESS INVENTION—Just Out!



Remarkable results have been secured with this new instrument for which we have just secured the exclusive agency. Continuous experiments carried on for over a year toward the improvement of spark gaps have resulted in the discovery of an entirely novel principle. Repeated tests with this new device have proven it capable of increasing the efficiency of an ordinary transmitter from 50 to 90 per cent. It consists of an air-tight chamber, containing four adjustable sparking spaces. Air is forced into this chamber by means of a pump which is furnished. The needle of a hot wire meter placed in the transmitting circuit climbs right up as soon as the air is applied, in a large number of cases to nearly twice the value obtainable with an ordinary spark gap. The construction is simple, neat and strong, and should last indefinitely. The instrument is so designed as to be suitable for use upon wireless sets of any type or size from the smallest up to one kw. We absolutely guarantee this instrument to increase the efficiency of your transmitting set at least 50 per cent., and will promptly refund the price without question in case it is found in any way unsatisfactory.

Price Complete, $12.00.

Dealers Attention—We have secured the exclusive distributing agency for this new device and are prepared to quote liberal terms to live dealers. Write us at once and be the first in your city.

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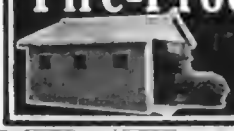
E. Roberts, Suite 39, 160 W. 119th St., New York

Fire-Proof Garages $30 and Up



The "Edwards" Send for handsome, illustrated 64-page Book of Edwards' Automobile and Motorcycle Garages. Sold direct from factory at unusually low prices. These are artistic, fireproof steel structures for private use. Give absolute protection from sneak thieves, joy riders, fire, lightning, accidents, carelessness, etc. Save all garage rent. Save time, work, worry and trouble. Come ready to set up. All parts cut and fitted. Simple directions furnished. Absolutely rust proof. Joints and seams permanently tight. Locks securely. Prompt, safe delivery and satisfaction guaranteed. Postal brings Book by return mail.

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ONLY $3.25 The watch you have always wanted—elegantly engraved thin model, American lever movement, ladies' or gents' size, open or closed face 20-year guaranteed watch sent postage paid for only $3.25. If you don't think it equals a $25.00 gold watch, return it to us and we will refund all money paid us. Order today—enclose only $3.25 and we will include free a gold finished chain.

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DEN PHOTOS

of the cutest society girls of Chicago in characteristic poses, never shown before. This cut No. 10 in 9 size mtd. and 40 other poses in Ill. Cir. by prepaid express, 50cts. in stamps.

MELLEN PHOTO CO.

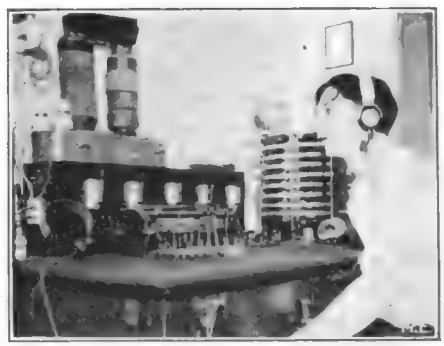
100 N. 5th Ave., Chicago

I am fifteen years of age and have been experimenting for 15 months.

My call signal is X F J and my transmitting range about 8 miles.—*Charles Jackson, Sydney, Australia.*

HONORABLE MENTION

Here is a flashlight of my wireless station, which I desire to enter in the wireless contest.



WIRELESS STATION OF E. R. LA DUKE

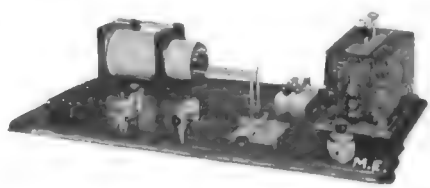
I use a one kw. transformer, with leyden jars placed under the transformer, a helix, spark gap and key with ¼ inch contacts.

Receiving set consists of a three slide tuner, one variable condenser, ferron and silicon detectors, and a pair of Brandes superior phones. My aerial is composed of four aluminum wires, 75 feet long and 50 feet high.—*E. R. La Duke, Denver, Colorado.*

HONORABLE MENTION

I am entering a photograph of my wireless set in the wireless contest.

The entire set with the exception of



COMPLETE SENDING AND RECEIVING SET OF RALPH F. PEO

switches is of my own make. The spark coil which is also home-made is rated at 1½-inches and gives a very hot spark about an inch long on twelve

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dry batteries. The secondary condenser is inside the coil case and is made up of alternate sheets of mica and tinfoil. It is permanently connected and adjusted. The spark gap is mounted on a fibre base on top of the coil. The key is mounted on a fibre base at the front of the main base and has large silver contacts. For an aerial switch I use an ordinary D. P. D. T. switch, but I also use a snap switch to disconnect the sending set when not in use.

For receiving I use Brandes Navy Phones (not shown in picture), a large loose-coupler, fixed condenser, and silicon and perikon detectors.

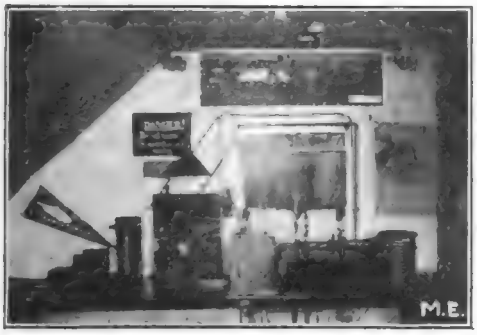
The wood is all finished in dark mahogany which gives the set a very handsome finish.

My aerial extends from a pole on the house to another one in the rear and is 48 feet long. It is made up of six phosphor-bronze, seven-strand wires and is of the loop type.—*Ralph F. Peo, Rochester, N. Y.*

HONORABLE MENTION

I am submitting a view of my wireless station.

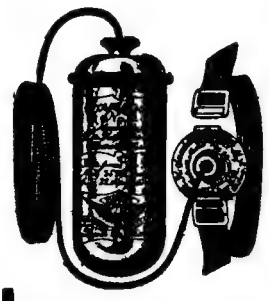
On the right may be seen the sending set which consists of a ½ kw. open



WIRELESS STATION OF FRED J. COSGROVE

core transformer, operated on 110 volts, 60 cycles. Also a glass plate condenser, helix, large key, and spark gap. The spark gap is muffled in a glass case, which may be seen in the illustration.

My receiving set is made up of an inductive tuner (loose coupler), a double-slide tuning coil which may be used either as a tuning coil or a loading coil, two fixed condensers, three detectors (two silicon and one galena) and 2,000 ohm Murdock receivers.



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My switchboard is in the center of the picture. The large D. P. D. T. switch in the upper left hand corner is the antenna switch. The S. P. S. T. switch under the antenna switch is to short-circuit the detectors.

My antenna is made up of six No. 14 aluminum wires, 75 feet high at one end and 45 feet high at the other end. It is 70 feet long and of the straight-away type.

With this set I get as good results as any amateur would want.—*Fred J. Cosgrove, Taunton, Mass.*

HONORABLE MENTION

I am submitting a view of my wireless station which is situated in the basement of my home in a special room.

The sending apparatus is as follows: 1½-inch spark coil, key, spark gap, plate glass condenser, helix and electrolytic interrupter. .

Receiving set comprises: Ferron detector, two silicon and galena detectors, receiving transformer, two loading coils (one especially intended for tuning in Arlington, Va.), fixed and two variable condensers, 2,000-ohm head set and special antenna switch, and potentiometer and switches for above.

The antenna is composed of four wires 70 feet long, 48 feet at one end and 38 feet at the other. With this receiving set I get all the Great Lake

WIRELESS STATION OF E. W. PHELPS

stations and Arlington, Va. My unusually good results with so small an antenna are due from having everything of the very best insulation, such as electrose insulators, etc. I can tune to about 4,000 meters with this set.

I expect, in a few days, to install a set of Marconi apparatus and will then obtain even better results.

I always look ahead for my copy of *Modern Electrics* because it furnishes me with a great mass of information each month.—*F. W. Phelps, Chatham, Ont., Can.*

HONORABLE MENTION

Enclosed please find photo of my radio station. Sending set consists of a home-made one-inch spark coil, rapid

WIRELESS STATION OF ORVILLE R. TOMANN

sending key, series spark gap and two oscillation transformers, all of which are home made. This set is connected to the antenna with a glass plate series condenser. The aerial is 20 feet long and consists of two wires for sending. For receiving I have a 200 foot four wire, 60 feet high antenna for long distance work. I use a loose coupler as described in Dec., 1912, issue, three slide tuner, variable condenser, and silicon, galena, and carborundum detectors, as well as a small variable condenser shunted across Brandes receivers. I owe my success with this outfit to *Modern Electrics* and Prof. W. W. Clark, of this city.—*Orville R. Tomann, Ellsworth, Wis.*

PICO HEIGHTS WIRELESS ASSOCIATION

A new wireless club has been formed in the city of Los Angeles, Cal., called the Pico Heights Wireless Association.

The officers of the club are: H. P. Peaker, president; Hobson Mojonier, treasurer, and Allen Wilmot, secretary.

All amateurs wishing to join the club, send name and address to the secretary.

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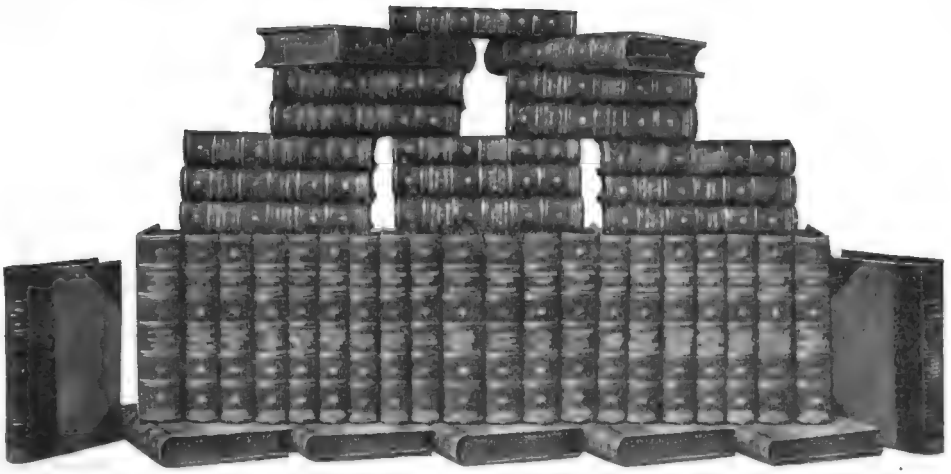

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Questions and Answers

Questions and queries pertaining to electrical and mechanical subjects and of general interest to all readers, will be answered in this department. Name and full address of the sender should accompany all inquiries. Questions that are not deemed by the editor to be of general interest, will not be published and no answers will be given by mail.

SPECIAL NOTICE

The following regulations must be observed in all letters written to this department:

(1) Only answers to queries of *general* interest will be published. Questions referring to particular cases, of no interest to any one but the inquirer, will not be answered.

(2) Opinions as to sending and receiving ranges will not be given.

(3) No attention will hereafter be paid to questions, the answers to which may be obtained from sources which every reader should possess. Such are the following:

(A) *Licenses for wireless sets:* Complete information regarding these will be found in "Regulations Governing Radio Communication," obtainable free of charge from the Commissioner of Navigation, Department of Commerce and Labor, Washington, D. C.

(B) *Location of Stations* whose call letters are given or vice versa. These are to be found in "Radio Stations of the United States," obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., price 15 cents.

(C) *Designs for Induction Coils or Transformers:* These are given in "Construction of Induction Coils and Transformers," obtainable from this magazine, price 25 cents.

(D) *Sizes of Condensers and Oscillation Transformers* for various sending sets. For these see the article on "The Wireless Amateur and the Wireless Law," January, 1913, issue of MODERN ELECTRICS.

(E) *Hook-Ups for Various Collections of Apparatus:* These have been published repeatedly and can also be found in "Wireless Hook-Ups," obtainable from this magazine, price 25 cents.

(F) *Wave Lengths of Aerials:* Use the curves given in the article on "Aerial Wave Lengths" in the January, 1914, issue of this magazine.

(4) Opinions regarding the merits of various makes of apparatus will not be given.

(5) Questions regarding "freak" occurrences in wireless receiving sets (such as peculiar cases of reception, buzzing noises in the phones, changes of sensitivity in detectors, and so on), will not be answered unless the editor believes them to be of general interest.

(6) Interference by power, or other electric currents in receiving sets will hereafter not be discussed; this has been repeatedly done and the proper remedies given.

(7) Not more than three questions will be answered. No attention will be paid to any above this number.

(8) No questions will be answered by mail.

(9) *All questions must pertain to the electrical or mechanical arts.*

(10) Name and address must always be given in all letters. When writing, only one side of question sheet must be used. Diagrams and drawings must invariably be on a separate sheet. All communications must be in ink.

Absolutely no attention will be paid to letters not observing the above rules.

ROTARY SPARK GAP, CONDENSER OIL AND EINTHOVEN GALVANOMETER

(1)—C. R. Russell, New Zealand, asks:

Q. 1.—Can a rotary spark gap be used satisfactorily with a ½-k.w. transformer coil and electrolytic break working on 110 volt d.c. mains; also to roughly explain the construction (design) of the fixed and rotary electrodes of a quenched rotary gap?

A. 1.—A rotary spark gap cannot be used in conjunction with an electrolytic

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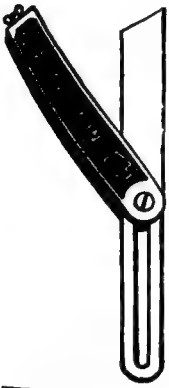

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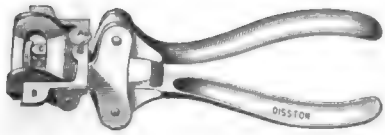

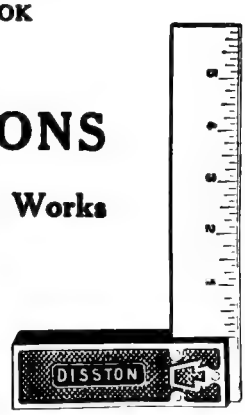

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interrupter, since the action of the latter is too irregular. If a mechanical rotary interrupter could be used, the gap could be mounted on the same shaft and would operate quite well. Such an interrupter could be built on the style frequently described in this magazine, for use with spark coils, proper modifications being made on account of the increased current it would have to break. For the constructional details of the electrodes see the article on page 927, December, 1913, issue of *Modern Electrics*.

Q. 2.—Do you consider a Blitzen variable condenser filled with oil (capacity .004) to be suitable for placing in series or shunt with the primary of a Clapp Eastham receiving transformer? Will the oil spoil the efficiency of the set or weaken the signals or make the tuning less sharp?

A. 2.—Yes. The effect of the oil in the condenser is simply to multiply the capacity the latter would have if it had only air between its plates, by a certain constant known as the dielectric constant of the oil. This varies somewhat with the variety of oil used, but ranges in the neighborhood of from 2 to 3. The presence of the oil would have no noticeable effect on the sharpness of tuning, and so forth, provided it is perfectly free from moisture.

Q. 3.—Where can the Einthoven single thread galvanometer be obtained, and what is its probable cost?

A. 3.—From Edelmann, at Munich, Germany. Cost, $41 (duty free).

INTERFERENCE WITH TELEPHONE, ABBREVIATIONS, RECEIVING TROUBLES

(2)—Albert Hunt, Mass., asks:

Q. 1.—Is there any way that I can prevent my sending set interfering with the telephone service? The company has complained of the terrific noise I make in their receivers when sending.

A. 1.—Keep the wiring of your set inside the house far away from the telephone line. String your aerial at right angles to the line outside the house and as far away from it as possible. Are you sure that the decrement of your wave is less than 0.2?

Q. 2.—What is the meaning of NR. 1, NR. 2, etc.?

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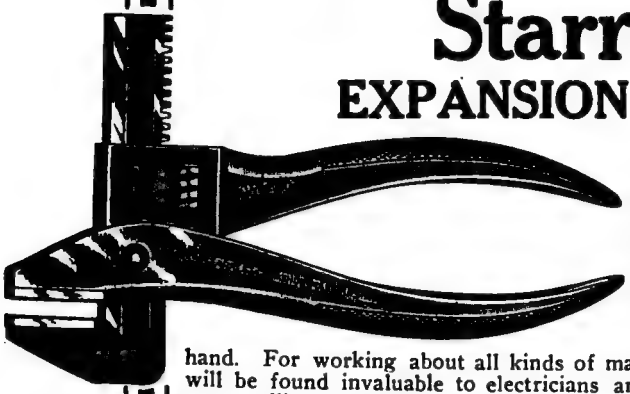

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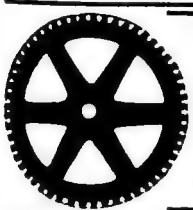

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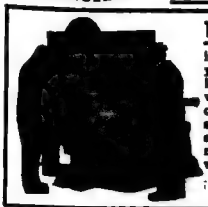

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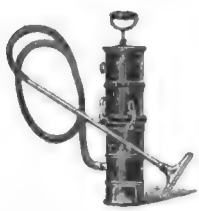

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A. 2.—These abbreviations are used by the various stations sending press dispatches or before private messages to indicate "Number 1, Number 2, etc." In a press dispatch they refer to the items, as they are sent, making up the dispatch. With private messages they indicate the numbers of the messages, as they are sent one after the other, when a station is sending more than one message to another station at a time.

Q. 3.—Why is it that when I have my receiving set tuned for NAA, I can hear NAD? The latter station is at least 48 miles from me.

A. 3.—Either you have an aerial circuit of such high ohmic resistance that you are not able to really "tune" or else NAD is using a "broad" wave. The wave lengths in question are 1400 meters apart.

LONG TRANSMITTING WAVE LENGTH

(3—O. G. F., California, asks:

Q. 1.—The radio inspector of this district has just notified me that the wave length of my transmitter is over 600 meters. I cannot see any reason for it as I use an aerial composed of only two wires, 90 feet long, 80 feet of lead-in. The connections between coil, gap, condenser and oscillation transformer are only 18 inches. What is the reason for so long a wave?

A. 1.—First, the fundamental wave length of your aerial is about 300 meters. Second, you are adding the extra wave length by using a large oscillation transformer. You will have to add a series condenser in your aerial circuit and adjust your apparatus to the sizes given in the article on the "Wireless Amateur and the Wireless Law," *Modern Electrics*, January, 1913.

Q. 2.—I use a four-wire aerial, but only use two wires for transmitting. Do the other two wires influence the transmitting wave length?

A. 2.—No; but they may create considerable loss by absorption of the waves emitted from the working wires. We would advise using the whole aerial with a series condenser, which can be cut out for receiving.

Q. 3.—Does the size wire in lead-in influence the wave length?

A. 3.—No.

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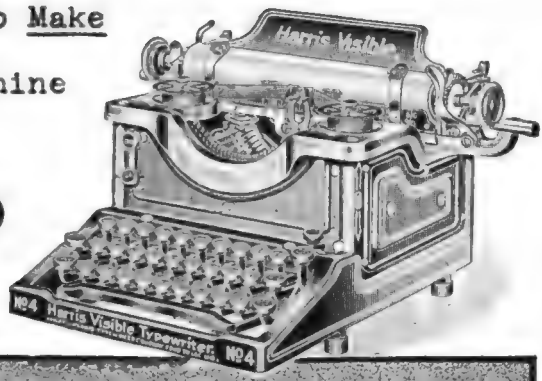

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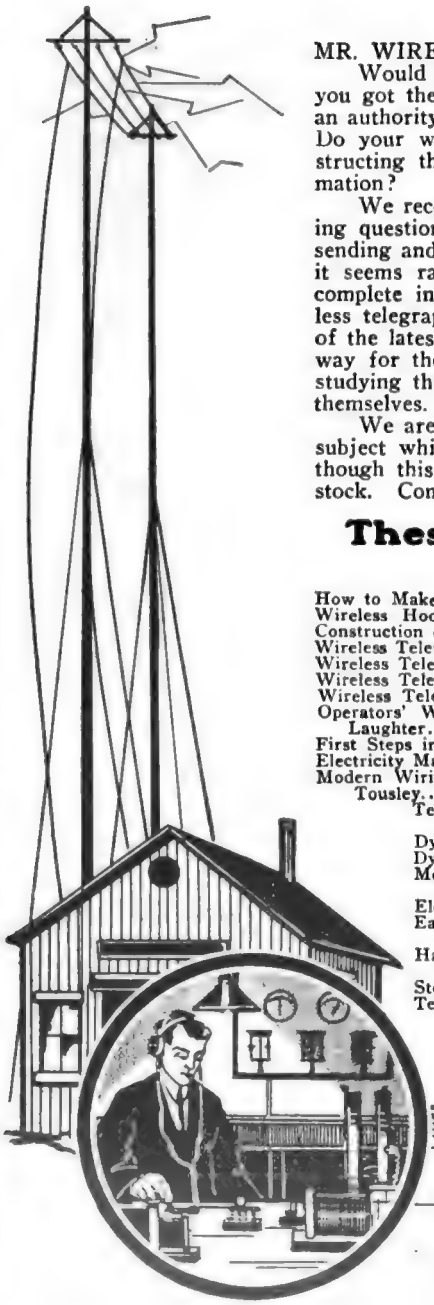

MR. WIRELESS EXPERIMENTER:—

Would you like to own a wireless outfit like this? Have you got the best wireless station in your vicinity? Are you an authority on the wonderful science of wireless telegraphy? Do your wireless friends come to you for advice on constructing their apparatus or do you go to them for information?

We receive hundreds of letters from our subscribers asking questions about constructing their apparatus, also about sending and receiving messages, and in view of the fact that it seems rather hard for the wireless experimenter to get complete information about the wonderful science of wireless telegraphy and telephony, we have put in a large stock of the latest wireless books, as we have found that the only way for the wireless experimenter to become efficient is by studying these books which are in fact a complete school in themselves.

We are listing herewith a few of the best books on this subject which will be sent postpaid on receipt of price, although this is only a small number of the ones we have in stock. Complete list furnished on application.

These Books Will Tell You How To Make It

How to Make Wireless Instruments	$0.25
Wireless Hook-ups	.25
Construction of Induction Coils and Transformers	.25
Wireless Telephone	.25
Wireless Telegraphy and Telephony. By Alfred P. Morgan	1.00
Wireless Telegraphy and Telephony. By C. I. Hoppough	1.50
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First Steps in Electricity. By W. Jerome Harrison	1.00
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Dynamo Building for Amateurs. By Arthur J. Weed	1.00
Dynamo Electric Machinery. By C. F. Swingle	1.50
Modern Electrical Construction. By Horstmann and Tousley	1.50
Elementary Electricity Up-to-date. By S. A. Small	1.25
Easy Electrical Experiments and How to Make Them. By L. P. Dickinson	1.00
Handy Vest Pocket Electrical Dictionary. By Wm. L. Weber	.50
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WIRE FOR DYNAMO, TRANSFORMER OPERATION LICENSE

(4)—Otto Babel, New York, asks:

Q. 1.—Please give size of wire necessary to wind a ¼-h.p. a.c. dynamo for 110 volts and 25 cycles as described in Grenert's "How to Build Dynamo-Electric Machinery."

A. 1.—No. 16, B. & S.

Q. 2.—Would this machine do to operate a ½-k.w. transformer?

A. 2.—Of course not. One h.p. is approximately equal to ¾ k.w. Thus the generator would be overloaded if connected directly to the transformer. You can, however, use it if a suitable choke coil is connected in series with the transformer to limit the current taken by the latter. Write to the company making your transformer for dimensions of the coil necessary.

Q. 3.—License question.

A. 3.—See notice at head of this column.

LOOSE COUPLER CONSTRUCTION, RECEIVING SET

(5)—William E. Cunningham, Ontario, writes:

Q. 1.—I am making a loose coupler, and understand that each turn of wire must be spaced from the next. How can I do this?

A. 1.—This is only necessary if bare wire is used. Use insulated wire, and remove the insulation along the lines of the sliders.

Q. 2.—Are the following instruments sufficient for a beginner to start with (receiving only)? Silicon detector, loose coupler, two condensers in series, 2000 ohm receivers, potentiometer.

A. 2.—Yes. The potentiometer is not necessary with the silicon detector.

Q. 3.—Hook-up for above.

A. 3.—See notice at head of this column.

AERIAL, LAKE ERIE STATIONS, TESLA COIL FOR WIRELESS

(6)—Vernon Richards, Ohio, asks:

Q. 1.—Would a two-wire aerial, 100 feet long, be more satisfactory than a four-wire aerial 50 feet long?

A. 1.—Yes; for equal height.

Q. 2.—What stations on Lake Erie should I hear with this aerial and a set

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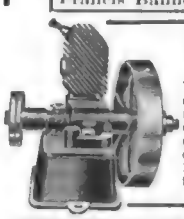
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How to Become a Successful Electrician
By T. O'Conor Sloane. Every young man who wishes to become a successful electrician should read this book. It tells in simplest language the surest and easiest way to become a successful electrician. The studies to be followed, methods of work, field of operation and the requirements of the successful electrician are pointed out and fully explained. 262 pages. Price, $1.00.

Standard Electrical Dictionary
By H. O'Conor Sloane. A practical handbook of reference, containing definitions of about 8,000 distinct words, terms, and phrases. 682 pages. 300 Illustrations. Price, $3.00.

Wiring a House
By H. Pratt. Shows every step in the wiring of a modern house and explains everything so as to be readily understood. Directions apply equally to a shop. Price, 25 cents.

Electric Toy Making, Dynamo Building and Electric Motor Construction
By T. O'Conor Sloane. This work treats of the making at home of electrical toys, electrical apparatus, motors, dynamos, and instruments in general, and is designed to bring within the reach of young and old the manufacture of genuine and useful electrical appliances. 140 pages. Price, $1.00.

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By T. O'Conor Sloane. A practical treatise on electrical calculations of all kinds reduced to a series of rules, all of the simplest forms, and involving only ordinary arithmetic; each rule illustrated by one or more practical problems, with detailed solution of each one. 186 pages. Price, $1.00.

Telephone Construction, Installation, Wiring Operation and Maintenance
By Radcliffe and Cushing. A practical reference book and guide for telephone wiremen and contractors. Every phase of telephone wiring and installation commonly used to-day is treated in a practical, graphic and concise manner. Intricate mathematics are avoided, and all apparatus, circuits and systems are thoroughly described. The appendix contains definitions of units and terms used in the text. Selected wiring tables, which are very helpful, are also included. 175 pages fully illustrated. Price, $1.00.

Commutator Construction
By Wm. Baxter. The business end of a dynamo or motor is the commutator, and this is what is apt to give trouble. This shows how they are made, why they get out of whack and what to do to put 'em right again. Price, 25 cents.

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231 FULTON ST. NEW YORK

consisting of tuner, condenser, silicon detector and 75-ohm single pole receiver?

A. 2.—Stations situated on Lake Erie are at Cleveland (WCX), Buffalo (WBL), Detroit (WDR). Whether you would hear them or not depends on natural conditions. You ought to hear many of the ships on the Lake, however.

Q. 3.—Can a Tesla coil be used for wireless purposes?

A. 3.—No.

TRANSMITTING TROUBLES, MOTOR FOR ROTARY GAP

(7)—E. J. Cunningham, Santa Clara University, California, writes:

Q. 1.—He has a set consisting of an electrolytic interrupter, ½-k.w. transformer, condenser of window glass enclosing twenty 7x12 sheets of tinfoil, rotary gap having 8 studs and operated at 1400 r.p.m., stationary gap which may be substituted, helix of 16 turns of wire 10" in diameter spaced ¾" apart. Aerial is 60 feet long, with a 30-foot lead-in. He says he cannot be heard more than three miles and ask why.

A. 1.—First of all, your two circuits (aerial and condenser) are too closely coupled when a helix is used. You are wasting energy in "back action" between these two, and this is being used up in your spark gap as heat instead of being radiated. See the article by J. Weinberger in the November issue of *Modern Electrics* on "Power Losses in Radio Sets" for an exposition of this sort of loss. Secondly, your two circuits are far out of tune. With your *whole* helix in, your antenna circuit only has a wave length of about 300 meters, while your condenser circuit, with only *one* turn of the helix in, has a wave length of about 1000 meters. Hence, even under your most favorable conditions you are forcing a 1000-meter wave upon an antenna which is only tuned to 300 meters; and even with the close coupling obtained in a helix arrangement you cannot get very much energy into the antenna. Thirdly, natural conditions (such as neighboring absorbing bodies, hills, etc.) may reduce your range considerably. We suggest that you read the articles on the "Wireless Amateur and the Wireless Law" in the December, 1912, and January, 1913, issues of *Modern Electrics*,

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using the sizes of apparatus there indicated, and employing an oscillation transformer instead of a helix, since the set you are now operating is contrary to Government regulations. We also suggest discarding the electrolytic interrupter and running the set directly on the 110-volt a.c. supply. You cannot operate a rotary gap with an electrolytic interrupter, as the action of the latter is irregular and not very readily controlled. You can, however, operate it very well when the set is fed with 60 cycle a.c. Run your gap at 3600 r.p.m. on an a.c. motor.

Q. 2.—I have two motors for the rotary gap—one for a.c. with a speed of 4000 r.p.m., the other for d.c. with a speed of 1400 r.p.m. Which shall I use and at what speed?

A. 2.—See last few lines of answer to Question 1.

Q. 3.—Would a ½-k.w. transformer, to be connected direct to a.c. supply, be better than present transformer and electrolytic interrupter? Would the hook-up be the same?

A. 3.—Yes. Hook-up is the same, the interrupter simply being omitted.

RECEIVING SET FOR LONG DISTANCE, AERIAL AND FORBIDDEN QUESTIONS

(8)—Paul Guthrie, Missouri, asks:

Q. 1.—What other instruments could be added to the following set for receiving 2000 miles—two variable condensers, loose coupler, fixed condenser, 3000 ohm phones, potentiometer and detector switchboard, described in May issue with same detectors?

A. 1.—Your set is complete, but we do not give answers regarding ranges. You might add a loading coil, series antenna condenser for short waves, and some kind of amplifying detector such as the audion (though none of these is necessary) for completeness.

Q. 2.—Please give hook-up.

A. 2.—See notice at head of this column.

Q. 3.—Give a suitable aerial for above set.

A. 3.—A suitable aerial would consist of four wires spaced 2 feet apart, 100 feet long, and 50 feet above ground, lead-in from one end.

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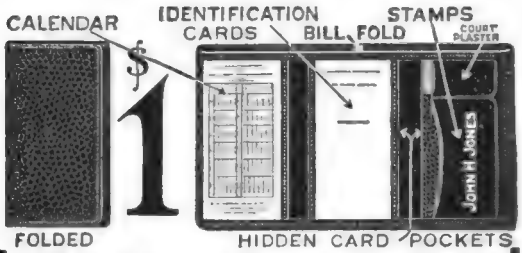

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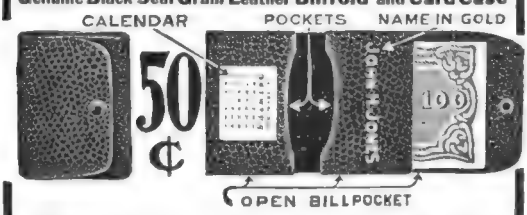

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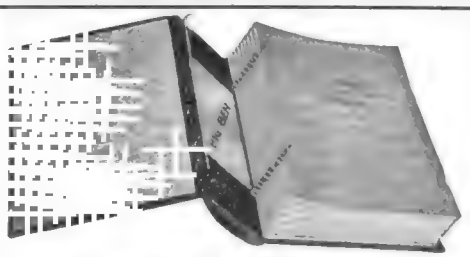

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NEW THINGS

(*Continued from page* 61)

aluminum, while the bands are of spring steel covered with rubber. The head set is exceedingly light and may be worn for long periods without fatigue. A novel ball-and-socket joint on each receiver enables the 'phones to be fitted most comfortably and readily to any shaped head. Holtzer-Cabot wireless receivers are furnished with six feet of green silk cord.

For literature and full particulars concerning the products of the firm, correspondence should be addressed direct.

LONG DISTANCE WIRELESS APPARATUS

In the brochure recently issued by The McCreary Moore Company, of Kansas City, Mo., one finds an interesting line of instruments for experimental and amateur work in radiotelegraphy. The company have been manufacturing instruments for some years, but it is just recently that enlargements in their factory have enabled them to supply more than the local demand for their apparatus.

Experience dating from the infancy of the science of radio-communication for both members of the firm and one member's experience for eight years as a Federal electrical inspector insure their designs being based firmly upon the most sound principles.

This company also manufacture high-frequency apparatus of every description as well as apparatus for radio-telephony, both of which are fields in which the near future will doubtless witness rapid and wonderful developments.

In glancing over this catalogue the instruments offered show a desirable rugged simplicity of general design in combination with adjustments of the most delicate nature, paradoxical features, but features that are the test of truly meritorious design. A rotary gap of novel design is also worthy of special mention.

Another item of great importance to the ordinary purchaser of wireless instruments is the cost of the apparatus and in this respect the McCreary Moore Company's catalogue bears favorable comparison with others of a similar nature.

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key and sounder, but if desired a buzzer may be substituted for the latter in order to imitate wireless signals. The transmitting device consists of a flat circular disc of metal around the edge of which numerous irregular notches have been cut. A lever fits against the edge and follows the irregularities. In so doing, it moves back and forth and opens and closes a circuit through suitable contact points, thus transmitting the message originally recorded by the notches. These record discs may be procured from the manufacturers at a very low cost. The messages may be sent at from 10 to 100 words a minute—a variation that meets the requirements of the beginner and even the most skilled commercial operator. By means of a recent improvement, the Omnigraph is now fitted with a device that enables the operator to change from one dial to another or place each dial in five different positions on the spindle so as to vary the order of the messages. Thus, from a few dials, almost any amount of variation in the messages can be secured.

Full particulars concerning the Omnigraphs can be secured by writing to the Omnigraph Manufacturing Company, 39½ Cortlandt Street, New York City.

A NEW WIRELESS CATALOGUE

The Clapp-Eastham Company, 143 Main street, Cambridge, Mass., have just issued a new catalogue on their complete line of high grade wireless apparatus. Copies will be sent to anyone on request.

A NEW ELECTRICAL INSTRUMENT

A novel instrument known as the "Buzzoplex" has recently been added to the extensive line of electrical and wireless instruments handled and manufactured by J. H. Bunnell & Co., 20 Park Place, New York City. The Buzzoplex consists of a high grade, high frequency, double wound vibrator mounted on a hard wood, highly polished base, together with a wireless key and the necessary binding posts. The vibrator is fitted with adjustments for varying both the tension on the armature as well as the distance of the stroke. It is an exceedingly useful instrument inasmuch as it can be employed for such purposes as testing crystal detectors, operating on a regular telegraph line several miles in length, for practicing wireless and even for sending wireless signals a short distance. By means of a suitable switch it is possible to secure different combinations in the wiring.

Aside from the Buzzoplex, J. H Bunnell & Co. handle and manufacture a large line of electrical, wireless and telegraphic instruments of all kinds aside from a regular line of electrical supplies. They have just issued a special catalogue on electrical holiday novelties containing a large number of Christmas suggestions, such as dry battery lighting outfits for trees, miniature electrical railroads, small dynamos and motors, wireless goods,

(*Continued on page* 91)

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(*Continued from page* 10)

concrete half a mile long, and is equipped with a floating boom having an additional reach of 500 feet.

The dam at Keokuk eventually will furnish more power than any other water power project in existence. This power is generated in a power house 1,718 feet long, 132 feet wide, and 117 feet high, by means of thirty turbines. Each turbine, with the generator, weighs over 500,000 pounds, and revolves at the rate of sixty revolutions a minute.

It was realized at the start that the turbines would be too large for railroad transportation over the mountains. They were accordingly built in Ohio, at Akron, and from there to Keokuk, water tanks, railroad depots, and freight houses had to be moved at a number of points. They were so routed as to avoid all bridges, excepting the new style of concrete bridges that are built without obstructions over the tracks. Each turbine is a casting of iron weighing 75 tons, 16½ feet in diameter and 11¼ feet high.

The turbine wheel fits into a chamber built especially for it, having four openings of different sizes, facing the upstream of the water. The partitions between these openings are so designed that the water coming through them will be swept by the curved surface of the inner part of the scroll chamber, so as to attack every inch of the circumference of the water wheel with equal force. From there it is carried off by a drain at the bottom of the chamber with a suction power equal to the original onrush against the wheel, thus obtaining a greater proportion of energy than from any wheel ever designed.

A system of guide vanes regulates the exertion of power on the buckets, the most interesting part of which is a governor so sensitive that when a street car stops for a fraction of a minute in St. Louis—thus requiring that much less power—the vanes will close correspondingly and then reopen when greater power is again required.

The electricity leaves the generator at 11,000 volts, but before passing out over

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the transmission line it is raised to 110,000 volts by means of a transformer. When it reaches the point of use, as for instance St. Louis, the current is stepped down again to 11,000 volts.

The cables on the transmission line consist of nineteen strands of wire built to resist a pull of 14,000 pounds. It is estimated that there would be a pull of 7,000 pounds were the cables encased in half an inch of ice at zero temperature with the wind blowing sixty miles an hour. These cables are carried on steel towers 79 feet high. There are 1,062 towers between Keokuk and St. Louis.

The development of water power in the past has been confined largely to the borderland of the country. Along both oceans, in New England and California, the points conspicuous for this feature in progress have been found. Keokuk in one bound has outdistanced any one power development plant in existence. The Mississippi at that point develops half the total power of all five plants at Niagara, an accomplishment that had been talked of since the old Mormon days of Nauvoo, only a short distance up the river, and which needed only the guiding hand of a genius to carry it to completion—the hand of Hugh Lincoln Cooper.

Wireless Telegraphy in Japan

EDITOR'S NOTE: For the information contained in this article, we are indebted to *The Japan Magazine*. We are also indebted to Mr. B. N. Burglund for his views concerning the present advancement of wireless telegraphy in Japan.

THE Japanese first began to take a serious interest in the possibilities of wireless telegraphy as early as 1886, when the noted electrician, Dr. Shida, set up an apparatus of his own construction on the banks of the Sumida river, Tokyo; but his attempts to send messages across the water by means of electric waves were not wholly successful. After European scientists began to publish the results of their investigations as to the nature of electric waves, the Japanese electricians turned again to the subject, and this time with greater promise of success. Dr. Nagaoka and Dr. Mizuno, of the Engineering Department of the Imperial University, Tokyo, now commenced an exhaustive course of investigation and experiment with some very encouraging results. In 1897 Dr. Asano, of the Electrical Section of the Department of Communications, Tokyo, set up a wireless telegraphic apparatus on the old forts in the Bay of Tokyo, and attempted to exchange messages with a station erected on the reclaimed land at Tsukijima, near the mouth of the Sumida River. In the meantime the great Marconi was going on with his wonderful experiments in Europe, and about 1895 he perfected his apparatus to such an extent as to have it considered a decided success, having it patented in England in 1896. Although the Marconi system was quickly taken up in Japan, the nation's own inventors and scientists did not cease their investigations and experiments, especially the electricians of the Department of Communications.

While free to admit all that they have learned from Marconi and other western inventors, Japanese have the satisfaction of having perfected a system of their own, which is now used in the Department of Communications. This system, known as the *Teishin-sho* system is adjudged one of the most complete on record. Naturally the new invention became a matter of immense importance to the Navy, for all the navies of the world were now installing wireless telegraphic apparatus on their ships, and Japan could not afford to suffer the disadvantage of being left behind. But she did not deem it a great advantage to have just the same system as that employed in Europe. Accordingly her naval electricians got to work, and with the assistance of these connected with the Department of Communications, a special system for use in the Imperial Japanese Navy was perfected, and adopted by the fleet. The code used by the Department of Communications was not regarded as guaranteeing sufficient secrecy for naval

(*Continued on page* 103)

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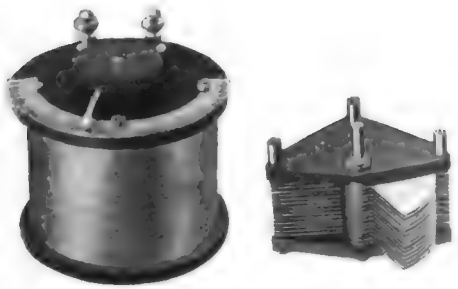

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AN IMPROVED OSCILLATION TRANSFORMER

(*Continued from page 28*)

mary and the secondary are both wound in the same direction, a closer coupling can be used than if they are wound in opposite directions. This is due largely to the fact that when the primary has built up its field and transmitted it to the secondary and from there to the aerial, the reaction of the aerial and secondary upon the primary is of such polarity that it has a quenching or rather damping effect upon the primary. In a large measure this result is due to lack of condenser effect in the primary and also to the residual current left in the condenser of the primary oscillating circuit which has not had time to receive its next charge and consequently presents an opposing current to the secondary or radiating circuit.

The author is going pretty deep into the subject for the average amateur to fully grasp and there are no known textbooks that cover very thoroughly condenser oscillations, excepting Flemming, who in his advanced works on radio engineering treats this subject fairly well, and every amateur is strongly advised to read this book so as to get a better understanding on how this rather complicated phenomenon takes place.

The following drawings are self-explanatory, but a few remarks may be added so as to facilitate their construction. The secondary, as will be noticed, is a keg or barrel-shaped piece of well-seasoned wood. It is far better to have a pattern maker construct this out of pattern wood and make it preferably hollow, although not absolutely necessary. The wood should be thoroughly seasoned, and the complete keg built up out of small pieces and glued; but it is advisable not to use metal nails as they might cause serious trouble. After the keg has been turned true in the lathe, it should be treated with grain alcohol and brown shellac, as described in the September issue of *Modern Electrics*. Seven turns of "Packard Cable" or its equivalent in insulation are then wound on each half, bringing out the top and bottom ends to large metal binding-posts or

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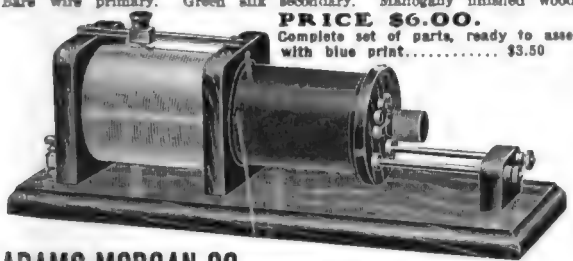

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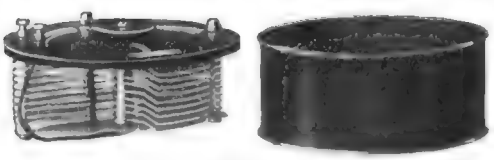
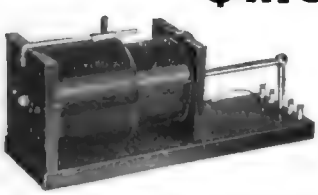


Rotary Variable Condenser



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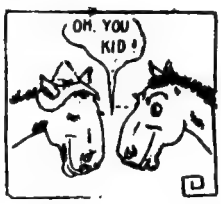

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lugs, one for the antenna and the other for the ground.

The primary is composed of laminated 1½ inch copper strips, preferably brush copper. Procure from any machinists' supply house the copper strips already cut to width and full length, three pieces in all. Take one piece and paste to its full length on both sides ordinary writing paper with shellac. Use this piece for the center of the three and when they are placed in the grooves and fastened as per diagram, the result will be a laminated primary winding with practically no eddy current losses in it. The clips for the primary may be of any design that permits them to clamp all three strips at once. The base can be made of any wood, preferably mahogany or mahogany stained birch, well finished. The same applies to the uprights, excepting where they touch the metal. It is best to use precaution in insulating against leakage due to moisture retained in the wood. A handle can be provided so that the secondary can be adjusted while holding down the key and consequently permit of finer adjustment and tuning.

WIRELESS TELEGRAPHY IN CHINA

Mr. B. N. Burglund, a frequent contributor to this publication, in a recent communication to us, expresses his views of wireless telegraphy in China. In part, he writes:

"China is way behind in wireless development; there are only a couple of stations in all China and these are under English control. As large a commercial centre as Hong Kong is, it still has no wireless station. All wireless traffic is handled by ships in the harbor."

The following are the names of the present officers of the Hudson Valley Wireless Association: Burr V. Deitz, of Slingerlands, N. Y., president; Milton Maguire, of Albany, N. Y., vice-president; Charles Z. Smith, of South Bethlehem, N. Y., corresponding secretary; Clayton B. Le Gallez, of Albany, N. Y., recording secretary; Andrew C. Dodds, of Albany, N. Y., treasurer; F. P. Huested, of Albany, N. Y., critic, and C. B. Le Gallez, of Albany, engineer.

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NEW THINGS

(*Continued from page* 83)

pocket flash lamps and electrical heating implements and cooking utensils. A copy of this catalogue as well as full particulars concerning the Buzzoplex will be mailed to anyone on request.

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Conservation of the health of the workman and making his surroundings more cheerful are being recognized more and more each day as most important factors in increasing the earning dividends.

Polishing work has always proved a menace to workers engaged in it, but at last attention has been directed to improving the conditions by health and factory authorities all over the United States. Although many devices for the removal of the disagreeable dust particles have from time to time appeared on the market, a new blower equipment recently introduced by Leiman Brothers is said to embody a greater degree of efficiency and compactness than any of the others. In this equipment, the suction or blower apparatus is directly underneath the bench and in such a position as to create a powerful suction directly at the buffing wheels. The constant stream of air draws every particle of dust and deposits it in a special tank, where it can subsequently be removed. The equipment is complete in itself, consisting of the suction apparatus as well as the spindles and necessary bearings and shafting for carrying the buffing wheels. It may be driven by a small electric motor and will serve equally well in the factory, shop, jewelry store, college or manual training school.

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In a recent experiment at Portsmouth, England, the practical efficiency of electrical waves for exploding mines at long distance without actual contact was strongly demonstrated, when the bottom was blown out of the old cruiser *Terpsichore,* which had been placed over the mine. The wireless waves were sent from a distance of eight miles and the explosion wrecked the vessel so seriously that she had to be towed immediately to port to keep her from sinking, although her watertight bulkheads were previously closed.—*Donald Shumway Rockwell.*

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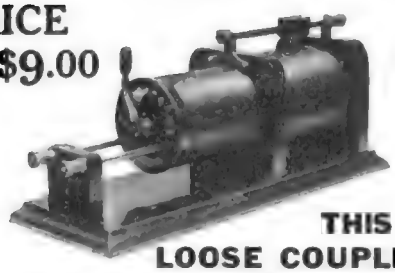

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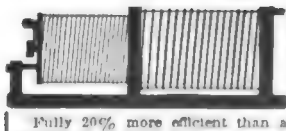

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(*Continued from page 31*)

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The compressed air principle and the structure of the new gap have been covered in a patent which is now pending.

HURON WIRELESS TELEGRAPH ASSOCIATION

A Huron wireless association was formed recently by six boys who met at the home of one of the members and adopted the constitution, laws, etc. The officers elected were: Walter Williams, president, and Edward Notestein, secretary.

The purpose of this association is for the experimentation and advancement of wireless telegraphy in Huron. Four members of the association have sets in active operation, while three sets are well in construction.

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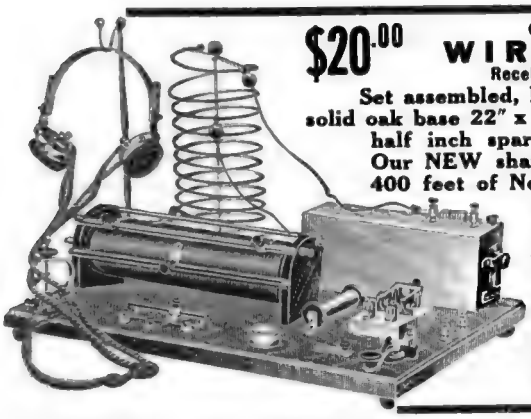

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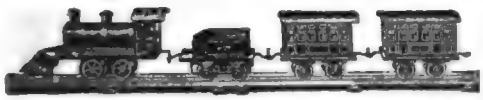
Birds extra -	.45	Santa Claus	.35



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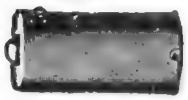

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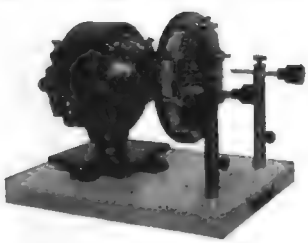

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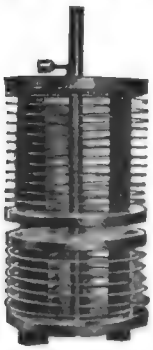

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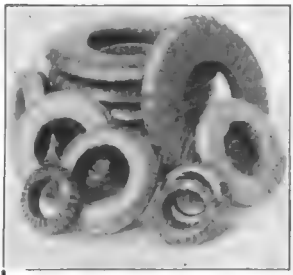

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CANADA.

VIA WIRELESS

(*Continued from page 64*)

crushed legs and lifeboats against cavorting broadsides of steel plates.

But the *Talaria* only churned and nosed and dipped to long, lazy swells a half mile between glassy summits—summits whose bosoms no zephyrs marred. Even the search for the stricken steamer was to be robbed of all spectacular aspects, it seemed.

The sluggish Britisher was on exactly the same course as the *Talaria,* and the rescuer had but to overtake her or the overladen boats that would be hovering about the swirling vortex where she had gone down.

Freddy's spirits came up with the *Talaria's* speed, and he reflected that a two-thousand-ton tramp with a crew of thirty wasn't such small game after all.

At any rate, it would probably get his name into the head-lines, and his vigilance would have its reward. He mentally began to frame the story he would flash broadcast as soon as the castaways were aboard.

He pictured the sodden, wallowing derelict looming suddenly in the path of the ill-fated steamer; the hoarse, belated cry of the lookout forward; the mad jangling of bells deep down in the engine room; the despairing blasts of the great whistle that announced "Full speed astern"; the terrific clatter and vibration of giant engines ruthlessly reversed; the jarring, horrifying shock as the steel stem crunched into the deadly hulk; the futile closing of overwhelmed collision bulkheads; the piteous wireless calls as the ship settled relentlessly by the head.

Then the blessings heaped upon the answering *Talaria* as the harassed crew tumbled into swinging lifeboats in the nick of time—pray God they *were* in the nick of time.

"Ought to be seeing rockets or a flare pretty soon, unless she has gone to the bottom," observed Captain Helme from the bridge. "We've about run down our distance."

"If she's sunk, don't you suppose they're aboard the derelict, sir?" suggested First Officer Crosstree.

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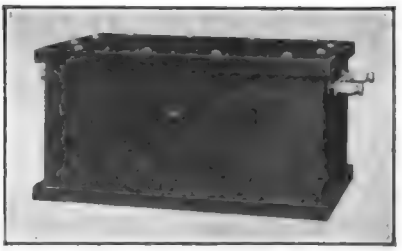

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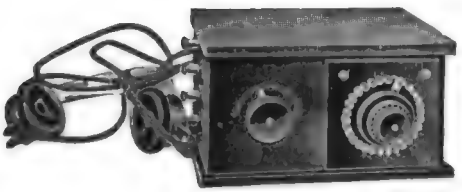

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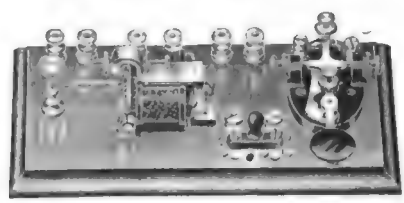

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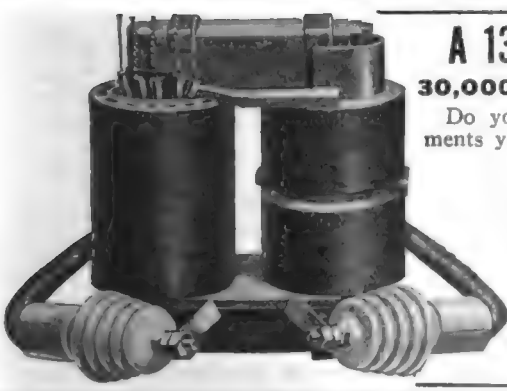

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"'Course not; they're in the boats," said Freddy confidently.

"Well, keep an eye out, everybody," said the captain; "and, Wireless, don't make so much noise with your mouth."

Presently the *Talaria* began to announce her arrival on the approximate scene of the disaster. Snorting steam burst from her whistle's brazen throat till it seemed as if some demoniac Stentor were raging inconsolably aloft.

Rockets soared from her bridge, and aft a tar barrel blazed its message of cheer, weirdly silhouetting the men around it. Helme slowed his ship to one bell, and still there was not an answering flicker of oil-soaked mattress or smoky lantern from horizon to horizon, much less the bright thread of a rocket.

And then, while the roar of her whistle and the stuttering clamor of escaping steam from the pipe drowned the swash overside, the *Talaria* hit something a glancing blow on the port bow that made her stagger. Helme stopped his engines dead for the protection of the propeller and dropped a boat from the falls by the run. All the boat's crew found was a couple of badly dented plates on the *Talaria's* bow at the water line and the portion of a wrecked vessel's side sluicing awash in the swell. It bore the sonorous legend, *Latour d'Auvergne.*

"I'm afraid that settles it," said Captain Helme soberly. "I'm afraid the smash did for both of them, but we'll stand by till daylight and make sure of it. A calm night like this, too! Ain't it pretty tough?"

Hours later a monstrous flaming sun came out of a flaming sea to show the drifting *Talaria* surrounded only by splintered wreckage, all that remained of the French bark *Latour d'Auvergne.*

No other craft showed on the desolate horizon, not even wreckage that looked as if it came from the luckless *Leviathan.*

Captain Helme reluctantly resumed his voyage to the blue Mediterranean, and the disgruntled wireless operator swallowed his chagrin and clicked off to whom it might concern, for the *Talaria* was now beyond direct shore communication, a harrowing account

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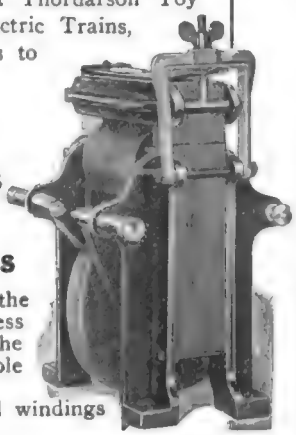

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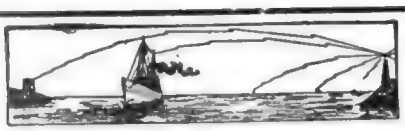

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of the tragedy, in which the redoubtable wireless operator of the good ship *Talaria* played no unimportant part.

Three days later the steamer, buffeted now by a stiff chop that matched the gray of a steely sky, doffed its white caps airily to a rollicking southeaster and promised other forms of entertainment, overtook a plodding white-funneled steamer, smacking through the pother broad off to the northward. Helme hauled up gradually and for a while the two fought for their easting side by side, in mute sociability.

Wireless Operator Frederick Ayre, wet with flying spume, white of face and shaky of limb, climbed the bridge to where Captain Helme reigned in yellow oilskins and sou'wester, braced sharply against the gale.

"That fellow," he gasped, waving an arm at the floundering steamer off to port, "says he's the *Leviathan!* I half believe he's the *Flying Dutchman.*

"Ay tank she bane one der *Leviathan's* sister ships, sir," volunteered the muffled quartermaster at the wheel. "Dey all got white stacks, ya."

"Tell him," said the captain sternly —he had been an old windjammer— "tell him that a man who would joke on such a subject ought to be strung up to the yard-arm—or the steam-pipe!"

And the outraged *Talaria,* scorning further common courtesy of the high seas, forged grimly ahead of the ill-timed jester. As inky night fell his low-lying smoke was only a smudge on the leaden sky astern.

While the storm-swept *Talaria,* listed heavily to starboard by a rampaging coal cargo and shorn of deck fittings from stem to stern, was recuperating a week later in the shadow of frowning Gibraltar, there entered the roadstead a white-funneled steamer whose elliptical stern, as she anchored near by, showed the words *"Leviathan,* of West Hartelpool."

Captain Helme called away his boat, silently beckoned Wireless Operator Ayre to follow, and the two were pulled across the quiet water to the newcomer.

She, too, had seen rough weather,

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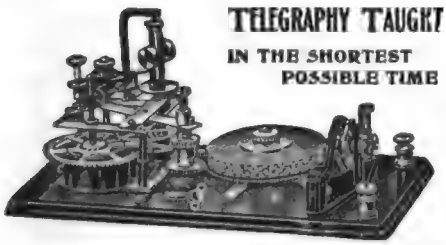

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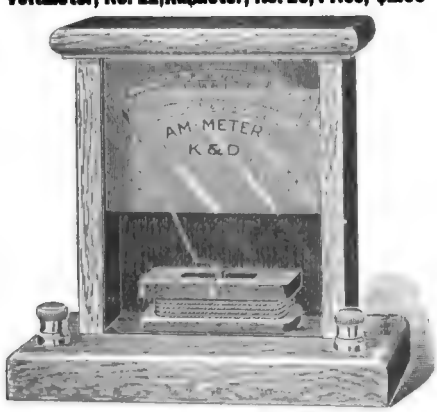

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and Captain Helme doubted that they would still be in the mood for pleasantries. Freddy ventured to assert that he didn't consider the *Leviathan's* wireless operator's position worth a hurrah in Halifax after such shameless trifling with the responsibilities of his office.

Then they scrambled up a Jacob's ladder dropped over the stranger's bleak side. The *Talaria's* skipper climbed the bridge to where a bedraggled brother captain leaned wearily on the pipe rail and dug flaked salt from his eyes.

"I suppose you got my message a few days ago," began Captain Helme crisply. "Now before I report you I want to know what in Sam Hill you mean by all this tomfoolery!"

"And before I kick you down stairs, I want to know if you realize whose bridge you're on!" said the other, rising nobly to the occasion.

"What was your idea in reporting yourself sinking after collision with a derelict?" demanded Helme, restraining himself with difficulty.

"Report myself sinking?" repeated the other blankly. "Sparks, come here!" he called to his wireless man. "These gentlemen of the *Talaria* have had a hard passage across, and as you suspected are a little queer in the upper story. Still, it wouldn't be hospitable not to humor them. Show them your duplicate copy of our report of the derelict Frenchman incident."

The *Leviathan's* wireless operator obediently went aft to his house, while Captain Helme looked queerly at his fidgeting subordinate. Then Sparks thrust the yellow slip into his commander's hand, and the latter presented it stiffly to Helme. Freddy read over the skipper's shoulder:

"S. S. *Leviathan,* Port Tampa for Genoa, N. Lat. 40 degrees 21 minutes, W. Long. 49 degrees 6 minutes, 5 P. M. Thursday fell in with derelict French bark *Latour d'Auvergne.* Am sinking her with dynamite as she is a menace to navigation."

"I'm sick of this job, anyway! Here's where I pull my freight," said Wireless Operator Frederick Ayre, anticipating his superior officer by something like two and a quarter seconds.

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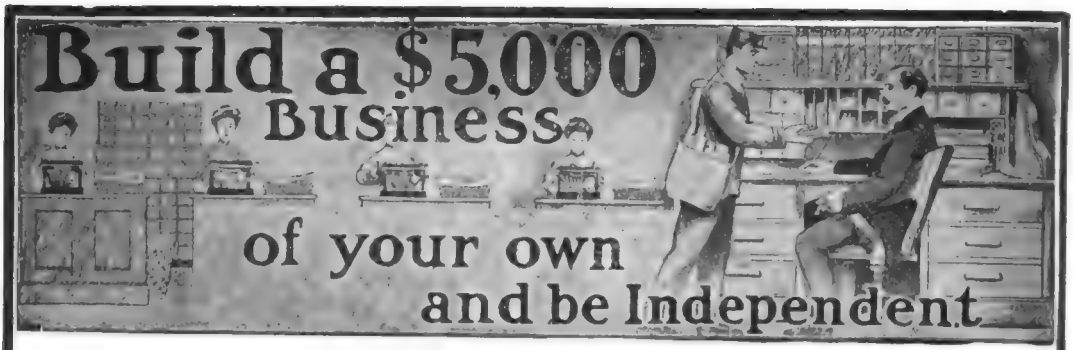

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WIRELESS TELEGRAPHY IN JAPAN

(*Continued from page* 86)

use; but the new system invented for the Navy, known now as the *Kaigun-sho,* enables the fleet to preserve absolute secrecy as to position and message, and is believed to be more scientifically perfect than that used by any other of the world's navies. This secret system, which owes its existence and efficiency largely to Professor Kimura, was used by the Japanese navy with telling effect during the war with Russia.

In Japan up to the year 1900 the longest distance between points of communication by wireless was about ten miles, the most satisfactory experiments having taken place between Shimosa and Kazusa. Soon, however, messages began to be exchanged between Kazusa and Sagami, a distance of 29 miles. And so, when in 1904 the *Teishin-sho* system was perfected and a patent taken out, Japan was ready for participation in the International Congress of wireless telegraph experts. The great conference met at Berlin in 1906, and Dr. Asano, was sent to represent Japan. The distinguished inventor learned a great deal about European methods and systems, which he put to good use after his return home. It was at this time that Japan became a member of the International Wireless Union; and later on, in 1908, Japan accepted an agreement on the basis of the International Radio-telegraph Convention of Berlin, whereby she joined the convention to co-operate in a world system and service by wireless.

To meet the convenience of shipping, a wireless station was set up at Choshi; and the number of stations has since increased to seven, namely: Shio-misaki in Kii; Ose-saki in Hizen; Tsunoshima in Nagato; Ochiishi in Nemuro, Hokkaido; Fukkikaku in Formosa; Dairen in Manchuria, as well as that already named at Choshi in Shimosa. The latter, like the others, is a modern plant of the latest equipment, having a tower with an elevation of 232 feet and is said to be capable of sending electric waves over a distance of 500 miles by day and over 2,000 by night. The Ochiishi station has the same sending power, but the tower is not

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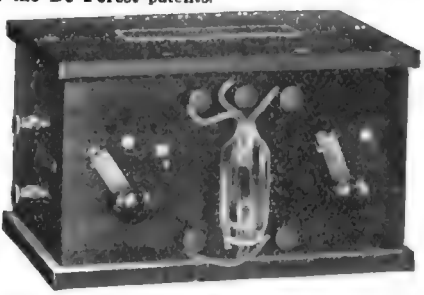

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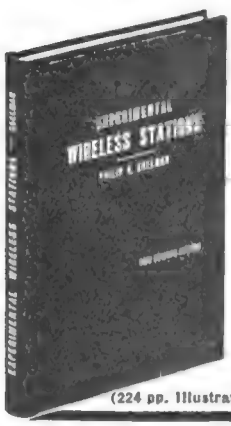

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more than 222 feet high. These are the two most important stations along the Pacific coast at present. The Formosa station is equally well equipped, having a tower of 234 feet in height. The Dairen station has a still higher aerial. Nearly all Japanese trans-Pacific liners are now fully equipped with wireless telegraphic apparatus, and many of the better class of coasting steamers are fitted with radio sets.

In the matter of wireless telephony Japan has made great strides. Her inventions in this respect are thought by those who have examined them, to be the best yet produced. After returning from the Berlin Conference in 1907 Dr. Asano was fully convinced as to the possibilities of wireless telephony; and he at once commenced investigations and experiments. Another noted expert in the Department of Communications, Mr. Uichi Torikata, was equally interested in the future of the science. These two men devoted many years to the development of wireless telephony with the result that to-day there are several radio-telephone stations for the use of ships actually in course of erection at Yokohama and Kobe, where experiments have already proved the possibility of wireless telephone communication between ships and stations on shore.

An American radio engineer states that while in Yokohama he had the privilege of listening to one of the Japanese wireless telephones. At the present time the Japanese are experimenting with a system which they call their own, but in the opinion of this engineer it is only a modification of the quenched gap. One or two of the Japanese stations are said to carry pretty good, but most of them only jam each other. The Japanese operators use a code entirely of their own, peculiarly adapted to their own language. Their tuning is said to be more or less wild and broad and their sparks are never clear and musical as in the European and American systems. However, it is but fair to state that the Japanese have undertaken the study of wireless telegraphy within recent years and it is only a matter of time when they shall be as highly successful in this branch of science as they are with all others they are engaged in.

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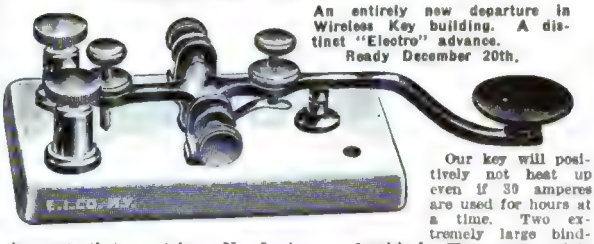

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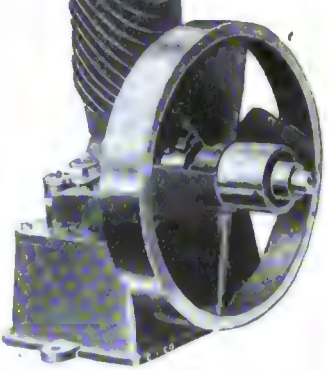

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A New Type of Tuning Coil

By Chas. E. Apgar

IT is generally admitted that sliding contacts on the primary winding of a loose-coupler or on a tuning coil are often inefficient because of the fact that they touch two or three turns at one time, resulting in the short-circuiting of one or more turns. It was with the idea of eliminating this principal and most serious objection against the sliding contact that the author designed a new method of making contact with windings.

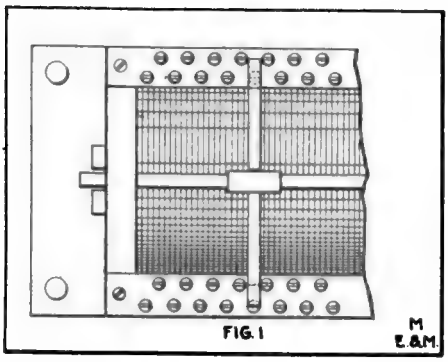

FIG. 1

When the sliding contact method is not employed, the usual procedure is to connect various turns of wire to a switch, the radial arm of which slides over contacts arranged in the form of an arc or a complete circle. In some designs two switches are used; one to control a section which really acts as a loading coil, while the other controls the turns of the tuner itself. Inasmuch as the switch is not a part of the coil, it necessitates the use of many leads of considerable length each. Among the many objections to these connecting wires is that of adding resistance without securing the much desired self-inductance.

A careful study of the accompanying plans will show that the author has overcome the objections referred to as well as evolved a very compact combination coil and switch. A type of construction has been adopted that permits of a very large number of contact points for a given length of coil. While the drawings are plain to anyone that has had experience in this line of construction, a few words of explanation may be of value to others.

The coil which the author has constructed and is at present using has a diameter of 4⅛ inches and a length of winding of 7 inches, permitting of 310 turns of No. 24 enameled wire. This gives rather a long wave length without the use of an additional loading coil.

As some primary winding must always be in use, the first lead to a contact point begins at the 60th turn and then at every fourth turn a short lead is brought to a point on one of the contact bars, each successive lead going to a different point on one bar and then on the other until at the fifth lead the connection starts again at the first row of points.

By an inspection of Figs. 1, 2 and 3 it will be noted that the only novelty in the arrangement is the design of the slider with its four spring strips that travel over the four rows of contact

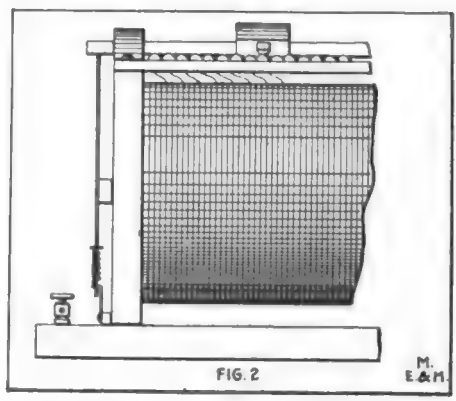

FIG. 2

points—two rows on each side—which are arranged in a staggered formation. The bars or strips carrying the contact points should be made of hard rubber. For the points the author used a small sized brass head furniture nail. The hole drilled for these is made of a size just large enough to force in the nail with the wire of the lead wrapped a few times around it.

As to the slider itself, it may be gathered from the drawings that it is secured to a piece of square brass tubing

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which slides on a square brass rod. Where the brass rod passes through the wood end pieces of the coil frame a section of round brass tubing is used that just takes the square brass rod on the inside and is just free enough to easily turn through the wood ends. This permits of a slight rotating action needed to pass from one contact bar to the other. The arrangement for controlling the amount of pressure on contact points as well as for switching from one contact bar to the other is shown in Fig. 3, which represents the end view of the coil frame. Through a hole in the projecting end of the square brass rod is secured, by either solder or threading, a round brass rod extending to about one inch from the base. A

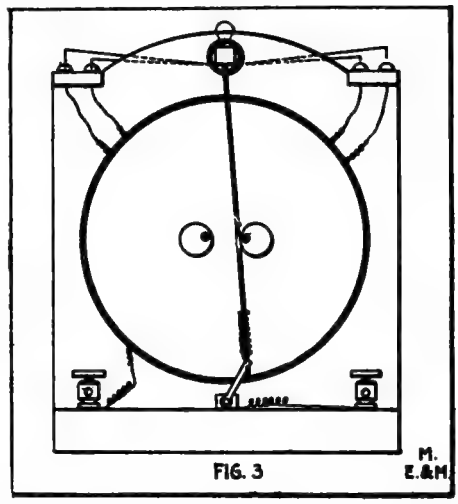

FIG. 3 M. E.&M.

small helical spring is fastened to this rod and presses against a hinged piece, thus forcing the rod, when off center, either to one side or the other. The slight rotating action is checked by two circular pieces of brass screwed to the ends of the frame by a screw that is placed off center. A slight movement of these pieces permits of greater or less action of the slider rod and therefore the pressure of the slider contacts on the contact points may be correspondingly varied.

This coil, with its 61 contact points, gives as close tuning as could be desired. By employing this tuner the author hears every night practically all messages sent out by the Government stations from Key West, Fla., to Boston, Mass.

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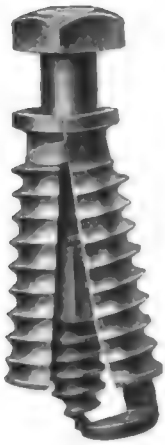
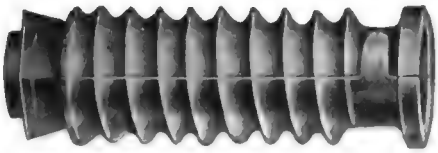

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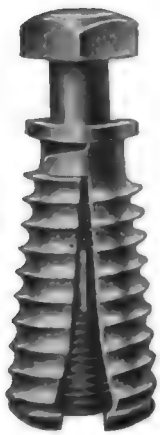
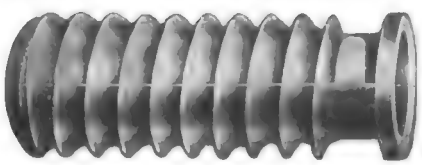
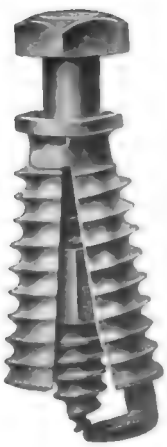

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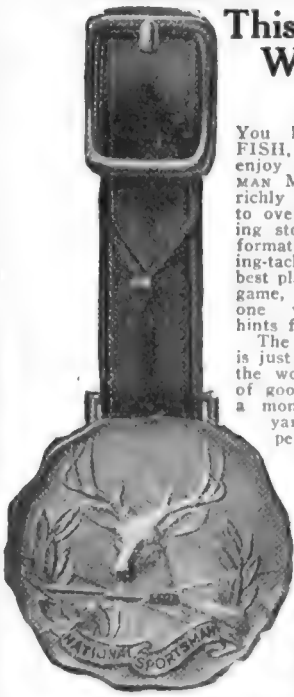

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After rescuing his head-'phones from sliding off the motor-generator into the cuspidor, and rubbing his stinging arms which had recently been burned by a hot equatorial sun, he righted his chair, replaced a cushion upon it, and was soon seated in front of his instruments again.

The light from his "Valve" Detector showed that the frown was still upon his high, noble brow; also it showed one hand nervously moving condenser handles and inductance sliders, while the other unmercifully pressed a receiver into his ear.

The circumstances giving rise to this touching scene were as follows: "Sparks," the operator, had been "listening in" some three nights before the happening of the little accident above mentioned, when he imagined he detected a human voice in his receivers—very faint, very far away, and yet distinct enough to thoroughly startle and fascinate him. Thereafter, for many long hours, he had sat at his receiving instruments vainly trying to find the voice again.

But nothing came to his straining ears save the incessant crash of static so prevalent in hot climates—no voice, no buzzing of a transmitting station, nothing.

Now, however, a feeling of expectancy began to take possession of him—the well-known feeling that the time for something to happen is at hand.

Crouching over his instruments he waited—almost forgetting to breathe in his growing excitement. Slowly and carefully he turned the knurled handle of a variable condenser. As he did this, a faint buzzing noise in his 'phones grad-

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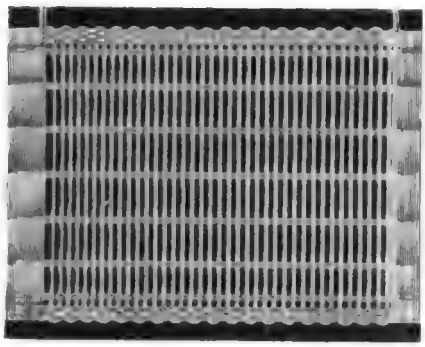

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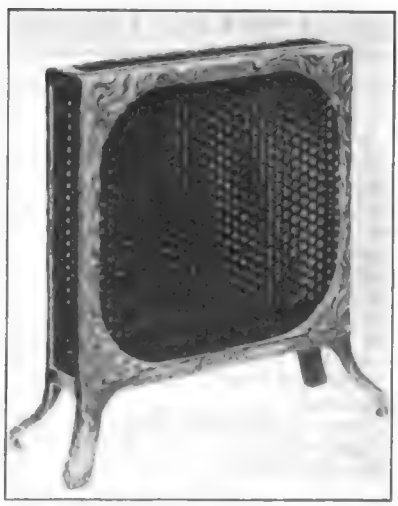

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ually became distinct above the static's roar.

Seizing a pencil and pad, he copied—one, two, three minutes. Then the whole was repeated, and at the end of the last word the faint buzzing ceased, leaving our hero alone with himself.

He glanced at the words written on the sheet, and with a sinking heart read: "The ship's orchestra will now play, 'Johnny, Get the Hammer; There's a Fly on Baby's Head.'"

A NEW WIRELESS GENERATOR

The United States Signal Corps has recently developed a new form of electric generator for use in connection with portable wireless sets that are capable of transmitting over a distance of fifteen miles. The generator is operated by means of a crank that is turned by two men. An automatic device is employed so that the speed is kept constant.

EXPERIMENTAL CLUB OF CINCINNATI

The above named club has elected the following officers: F. Fender, president; W. G. Frisscje, secretary and station inspector; L. Finch, collector of calls; W. G. Finch, treasurer. All those wishing to join are requested to correspond with W. G. Finch, whose address is 523 Torrence Road, East Walnut Hills, Cincinnati, Ohio.

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"Waiter," asked the impatient customer, "do you call this an oyster stew?"

"Yessuh," replied Mr. Erastus Pinkley.

"Why, the oyster in this stew isn't big enough to flavor it."

"He wasn't put in to flavor it, suh. He is jes' supposed to christen it."—*Washington Star.*

JUST A HINT

They had scrambled through the first dance on the program, and he was leading her back to a seat.

"I could die dancing, couldn't you?" he asked.

"No," she replied. "There are pleasanter ways than being trampled to death."—*Cincinnati Enquirer.*

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THE PANAMA-PACIFIC EXPOSITION AND PATENT PROTECTION

(*Continued from page 32*)

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Advice on Patents

AN ELECTRIC BURGLAR TRAP

(1) Dennis T. Murphy, of Clinton, Mass., sends in a diagram of an electric bank trap and asks whether this invention would be patentable.

(A.) As far as we can judge, your idea represents a very novel scheme, although we believe that it would not be worth while securing a patent on same. The reason for this is that the installation of your system would be far too costly and that there are many other systems for effecting almost the same results that are inexpensive.

A NEW DESIGN FOR ELECTRIC LAMP

(2) M. Maltz, of Newark, N. J., sends in a diagram of a new style of electric lamp and asks our opinion.

(A.) As far as we can judge, the idea you suggest appears to be a very good one and entirely practical. Providing the cost of making such a lamp is not too great, there should be a considerable sale for it, since its life is much longer and, by means of the switching attachment in the base, any degree of light may be obtained. We would advise you to communicate with some patent attorney and have a search of the Patent Office records made to determine whether such a device has not already been patented.

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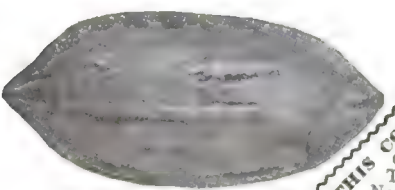

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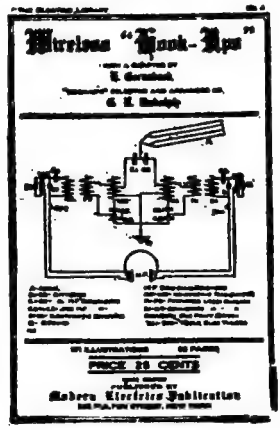

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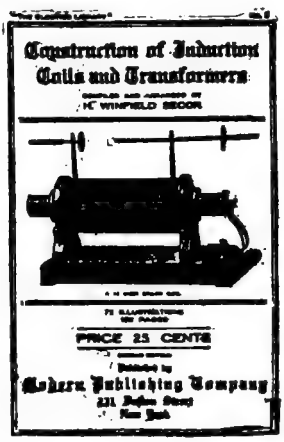

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AN ELEVATOR SAFETY CLUTCH

(3) John H. Hardy, of Montreal, Canada, sends in a drawing showing a safety clutch operated from within an elevator to prevent dropping when the cables are broken.

(A.) We do not believe that the idea presents sufficient novelty to make it worth while securing a patent. Furthermore, there are many safety devices on elevators in actal use, that work satisfactorily. As a matter of fact, your safety device must be operated by hand and we believe that in times of danger, such as the breaking of an elevator cable, the operator could not be relied upon to pull the lever operating the safety device. Most devices on the market for this purpose are therefore automatic in action and as far as we are able to learn they are highly satisfactory. It is therefore evident that this field of invention is pretty well covered already.

APPARATUS FOR PREVENTING LOSSES FROM DEAD ENDS

(4) Carroll Pfleegor, of Milton, Pa., sends in a sketch and asks for an opinion concerning a device to prevent losses from dead ends in radio receiving apparatus.

(A.) We would advise that this idea is far too complicated to be generally employed. There would probably be a very small market for it. Accordingly, it would not be worth while to make application for a patent.

LIGHTING BY MEANS OF WASTE HEAT

(5) M. Wilkins, of Muskogee, Okla., writes stating that he desires information as to the value of a system for lighting a room from the waste heat of a stove.

(A.) The idea is certainly a very novel one and represents an interesting scheme for utilizing the heat of a stove for another purpose aside from that of warming the room. However, we do not believe that a sufficient amount of current could be generated by the method you describe to make the plan practicable. Our suggestion would therefore be to improve on the current generating member.

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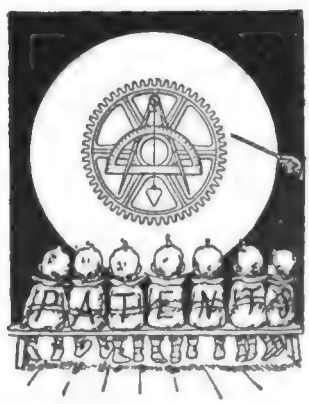

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Advertisements should be addressed to "Apparatus Exchange Department," care *Modern Electrics and Mechanics*, 231 Fulton St., New York.

Advertisements for the February number should reach us on or before December 31st.

WANTED: A PAIR OF BRANDES SUPERIOR phones. Have for exchange an omnigraph worth $4. Will pay balance. Ernest Lang, 411 Spring St., West Hoboken, N. J.

HAVE A 12-SHOT MARLIN 44-CALIBRE rifle, a $40 collection of stamps, a 22-calibre Stevens "Favorite" rifle, a $10 drawing set, a $9 camera, a $6 camera, a $2 enlarging camera and 11 Tom Swift's books, valued at $2.75. Will exchange all or part on a good receiving set. Fred E. Hughes, R. F. D. 1, Hillsboro, Ore.

IN THIS VALUABLE BOOK WILL BE FOUND everything that is necessary for the study of telegraphy. Rules are given for the guidance of operators in all different kinds of services, and they are very clear and comprehensive. "Telegraphy Self-Taught; A Complete Manual of Instruction," by Theo. A. Edison, M. A., 12mo., 170 pages, fully illustrated. Price, $1.00 postpaid. Modern Publishing Co., 231 Fulton St., New York.

WILL EXCHANGE ONE RECEIVING SET, a telephone receiver, with cord; two telegraph sounders of 5 ohms, two snap switches, three lights and sockets, a flashlight, a buzzer and push button, three extra sockets and one brass socket. What have you? Harold Stoneman, 90 Elmwood Ave., East Orange, N. J.

HAVE FOR EXCHANGE—75-OHM RECEIVERS, Fleming valve detector, receiving coupler in case, small dynamo, Monitor bell, small motor, magneto and sending helix. Want audion, wireless goods, small transformer, supplies and material. E. R. Hough, Johnstown, N. Y.

HAVE A FIVE-VOLUME SET OF MACHINIST books bound in best leather, adapted specially for a man who wants to be a master mechanic. Books are in first-class condition and cost $54.00. Will exchange for good wireless outfit. Guy Beam, 44 St. Charles St., Lestershire, N. Y.

DO YOU WANT THIS BOOK, WHICH TELLS you how to test and operate all different kinds of electrical apparatus, from generators and motors to lamps and bells? Only $1.50 postpaid. "Electricians' Operating and Testing Manual," by Henry C. Horstmann and Victor H. Tousley, 16mo., full leather, and chuck full of the right kind of information, which can be readily mastered by the layman as well as the experienced man. Modern Publishing Co., 231 Fulton St., New York.

WILL EXCHANGE ONE DYNAMO RUN BY water motor; size, 7½x6x6½. One four-coil motor; size, 7x4x6. One telegraph key and sounder, rubber covered coils; size, 7x4½x4. For complete wireless sending and receiving set. William Harding, 1221 Hennepin Ave., Minneapolis, Minn.

WILL EXCHANGE A 22-RIFLE, 500-SHOT Daisy, battery motor, medical coil and 0-30 ammeter, for a pair of good 2,000-ohm phones with head band. Brandes preferred. E. A. McGilvra, 608 13th Ave., S. E., Minneapolis, Minn.

WANTED—ONE KILOWATT TRANSFORMER, closed core. Will give two ammeters, 1 to 40 and 1 to 80 scales; A. C. voltmeter, D. C. voltmeter, ½ K. W. coil; one A. C. motor, value $25; ceiling fan, 1-inch coil; Pr. Western Electric phones, 1 Horse D. C. motor, one transformer, 110 to 6 volts; two detectors; single slide tuner, loose coupler. J. Yates Van Antwerp, 12 South Perry St., Johnstown, N. Y.

"WIRELESS HOOK-UPS," CONTAINING 96 pages and 100 hook-ups, is full of diagrams fully illustrating every possible wireless connection. This book will enable wireless men to get excellent results. Sent postpaid for $0.25. Modern Publishing Co., Book Dept., 231 Fulton St., New York City.

HIGH GRADE TUNER, TWO FERON DETECtors, variable condenser, fixed condenser, all mounted in a mahogany case; also one pair 2,000-ohm phones. Sending set consists of Thordarson transformer, Type HO., 1-inch coil, key, condenser and helix. In exchange for a motorcycle or a well-made guider. Augustine Francis, 295 Walnut St., Brookline, Mass.

FOR EXCHANGE—ONE SPLIT BAMBOO FISH pole, with extra tip and case; 2 doz. first-class fly hooks, assorted; one Japanned bait box; all new; never used. Want 110 V. A. C. or D. C. motor, or wireless goods to value of $3.75. Must be in good condition. Ross Stinson, 2428 Pacific Ave., Hoquiam, Wash.

WILL EXCHANGE 75-OHM RECEIVER WITH headband and cord; porcelain base D. P. D. T. knife switch, electric engine with wind mill; for 1,000-ohm receiver or receivers, without or with headband, and two detectors, silicon and galena preferred. Loughnan Smith, 18 Maiden Lane, Kingston, N. Y.

BEAUTIFUL PHOTOGRAVURES—SIZE 7 x 10 in. of Thomas A. Edison and Nicola Tesla. Suitable for framing—Just the thing for your den or station—10c each or the two mailed postpaid on receipt of 15c stamps or coin. W. A. O. A., 231 Fulton St., New York City.

FOR EXCHANGE—800 FEET OF NO. 10 aluminum wire; just the thing for aerials. Will exchange for anything electrical. Harry Pritchard, 618 East A St., Grants Pass, Oregon.

WILL EXCHANGE A 110-VOLT, 60-CYCLE,, ½-H. P. A. C. motor; a 110-volt, ¼ H. P. D. C. motor; a 1-inch spark coil (new); a homemade loose coupler; an electrolytic rectifier (4 jars); large condenser rack; variable condenser; a large electric bell, and a wireless key. Want stamps, old coins, good dynamo, storage battery, arc light or step-down transformer, or what have you? Robert Giboney, 408 E. 16th, North, Portland, Ore.

I HAVE A WIRELESS KEY, A BATTERY motor. The motor I have used for a rotary spark gap. I also have a buzzer and a No. 2 Brownie camera, which is new. Would like to get in exchange a small receiving set or a double slide tuner. Address M. Nelson, care Broadway Pharmacy, Aberdeen, Wash.

THE REAL ESTATE EDUCATOR CONTAINS inside information not generally known. Don'ts in Real Estate, tells all about the real estate business from A to Z. $1.00, postpaid to any point in the U. S. on receipt of price. Modern Publishing Co., 231 Fulton St., New York City.

WANTED—AN AUDION OR 10-AMPERE BOSton key, in exchange for double slide tuning coil worth $2; a Bunnel main line relay of 150 ohms worth $8; ½ pound s. s. c. magnet wire worth 60 cents, and a telephone transmitter. John Chandler, Box 423, Two Harbors, Minn.

FIRST STEPS IN ELECTRICITY, OR ELECtricity for the Beginner! Doesn't that title sound interesting? It is just what it denotes, or maybe more, because it starts off with the development of electricity, explaining fully in a purely descriptive manner how to perform simple experiments with as little expense as possible. 283 pages, 114 illustrations, pocket size, cloth cover. Price, $1.00 postpaid. Modern Publishing Co., 231 Fulton St., New York City.

WIRELESS OUTFIT CONSISTING OF 14 INstruments, several switches and other accessories, mounted on base 2 by 3 feet, all connected, ready to send 25 and receive 500 miles. Want repeating shotgun and typewriter. Any good offer considered. J. P. Koch, Hawthorne, N. J.

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HAVE ¼ to ½ K. W. CLOSED CORE TRANSformer, with five variations of power, to exchange for high grade receiving apparatus, navy phones, good perikon, Clapp Eastham loose coupler; also commercial detector, with ferron crystal for Blitzen variable. Southgate, 23d St., Y. M. C. A., New York.

WANTED—A LOOSE COUPLER (MURDOCK or Blitzen), Perikon detector stand and a Blitzen variable condenser. Have a commercial detector stand with marble base, Gillette Safety Razor set, 2¼ by 3¼ Brownie camera, and a stamp collection in Scott's Imperial Album of over 700 diuerent kinds. John C. Doolittle, Box 104, Centralia, Fla.

JUST OFF THE PRESS — BOUND VOLUME No. 5 of Modern Electrics; contains more real information than is found in $50.00 worth of electrical books; 1,344 pages; 2,100 illustrations; 1,650 questions and answers. A veritable encyclopedia on electricity. If you are a student of electricity or desire to keep in touch with the electrical progress of the world you can't afford to be without this wonderful collection of data on inventions, illustrations and writings of leading authors from every part of the world. Positively only 39 sets left. Orders will be filled as received and money returned when supply is exhausted. Price $3.00; 65c extra by mail in U. S.; 95c extra in Canada. Modern Publishing Co., 231 Fulton St., New York, N. Y.

WHAT HAVE YOU TO EXCHANGE FOR 5 lbs. of German silver wire, No. 28 d. c. c. R. M. Canfield, 26 Dodd St., Bloomfield, N. J.

WANTED—A TWO-INCH SPARK COIL IN EXchange for 2½ lbs. No. 36 black enameled magnet wire; small fixed condenser; one assembled core for 4-inch coil; two books on coils, one book on wireless outfits, one book on Wimhurst machines, and one book on Primary Batteries, and one new buzzer. Frank Prima, 123 Poplar St., Jersey City, N. J.

WANTED—APPARATUS OF ANY KIND. Have for exchange a commercial perikon detector, two Ferron detectors, two pairs of phones of 2,000 ohms each, a carborundum detector, a detector worth $2.50, four cat whisker detectors worth $1.50, 3 antenna switches, a No. 1a Eastman kodak, an aluminum aerial, three-bar magneto, a magic lantern and a 1,000-shot air rifle. Write to Maurice Winglemire, Holly, Mich.

MR. ELECTRICIAN: DO YOU KNOW ALL about wiring diagrams and descriptions? If not, you need this book, which is the latest out on the subject, "Modern Wiring Diagrams and Descriptions," by Henry C. Horstmann and Victor H. Tousley, 16 mo., 300 pages, 225 illustrations. Full leather binding, size 4 x 6 inches, pocket edition. Price, $1.50 postpaid. It explains dynamos and motors, alternating current and direct current, ground detectors and storage batteries, installations, etc. Modern Publishing Co., 231 Fulton St New York.

WILL EXCHANGE ONE BICYCLE IN GOOD condition for small printing press, or a small electric dynamo of standard voltage. Must be in good condition. Address James Tillery, 88 Bainbridge St., Dublin, Ga.

WANTED—COLT'S AUTOMATIC 25 CALIBER 7-shot pistol, in good condition, or set of Brandes Navy type receivers, in exchange for 2½ K. W. open-core transformers and interrupter. All in good condition. Boyce Miller, 401 S. 15th St., Independence, Kans.

WILL EXCHANGE $15 LOOSE COUPLER, fixed condenser, and a 5 ohm telegraph set, for a ¼ or ½ K. W. Transformer; also have a No. 5778 Omnigraph in exchange for static machine or chemistry or electrical books, value $5. Roy Heath, 1007 S. Arizona St., Butte, Mont.

TO EXCHANGE: 1 HIGH GRADE SENDING and receiving, consisting of 1 ½ K. W. Magnetic Leakage Transformer, 1 Oscillation Transformer, 1 Rotary Gap complete with 110 volt A. C. motor, condenser key and switch and fuses; navy type receiving set with 2,000 ohm phones finished in black walnut and audion complete with battery rheostat and necessary switches also finished in black walnut; would like a motorcycle in first class condition or anything of equal value. Kenneth McLoad, 3962a Blaine Ave., St. Louis, Mo.

BOXING GLOVES (4 OZ.) AND PUNCHING bag wanted for 50 watt dynamo; also have about 80 bound books (brand new) which I will exchange for wireless apparatus; if interested write. Harry Luckert, 915 Jackson Ave., New York City.

YOUR LIBRARY IS NOT COMPLETE WITHout a copy of Bound Volume No. 4 of *Modern Electrics*, containing 958 pages, with over 1,600 illustrations and 1,200 questions and answers on topics of vital importance to you. Elegantly bound in black cloth; gold stamped. Our supply is limited, so order today while you think of it and you will not be disappointed. Price $2.00; 40c extra by mail in U. S.; 75c extra in Canada. Modern Publishing Co., 231 Fulton St., New York, N. Y.

WILL EXCHANGE 12 VOLUMES OF ENCYclopedia Britannica, complete set, in fine condition, for set of 2,000 ohm phones, variable condenser and detector, or make me offer; collection of 1,000 stamps, many good ones, to exchange for phones, 2,000 ohm, and detector. A. P. Ruhl, 110 W. 129th St., New York.

LEARN TO FLY—BIG TWO-FOOT BLERIOT Monoplane. Latest model, knocked down, packed, ready for mailing, with blue print and complete drawings for assembling, with wheels and propeller. This model is usually sold by dealers for $2.00. Boys all over the country are having barrels of fun with them. For good, wholesome amusement, there is probably no flying device more entertaining and that will afford more fun for the boys and grown-ups than this pleasing toy. Guaranteed to fly or money refunded. Sent prepaid on receipt of price, $1.00. Model Flying Machine Company, 172 Greenwich St., New York City.

WANTED—SMALL 110 VOLT, 60 CYCLE, A. C. motor suitable for running rotary spark gap or rotary spark gap complete or Blitzen rotary variable condenser in exchange for any or all of the following articles: One 1 in. spark coil, one 2 in. snark coil, spark gap, condensers, telephone coil, telephone transmitter, etc.; write me, state your wants and what vou have to exchange. Glenn King, 813 9th St. So., Fargo, N. D.

WILL EXCHANGE FIFTEEN CLOTH BOUND boys' books for a ¼ in. spark coil; books are worth at least $3.75; if you have a coil 1 in. or under to trade, write me stating what you want. Leslie Jones, Charlestown, Ind.

WILL EXCHANGE A PAIR OF NEW 2,000 ohm phones and a Ferron detector; need a couple of rotary variables and an audion, also key; write me. H. Peterson, 154 Westminster Ave., Arlington Hts., Mass.

YOU CAN TURN YOUR SPARE TIME INTO dollars by taking subscriptions from your friends and acquaintances. You as a regular reader of Modern Electrics and Mechanics know its good points and can present its attractive features in a way which will readily make subscribers of your friends and acquaintances. Convince me that you are in earnest and willing to push things; send me the endorsement of three responsible business men who are willing to vouch for your fitness and I'll gladly send you your official appointment papers, together with full particulars as to how to go about the work, and how much there is in it for you. Don't delay until some one else in your territory has secured the appointment. Write your application to-day. M. C. Cooney, Manager Local Agents Department, Modern Publishing Co., 231 Fulton St., New York City.

WILL EXCHANGE A 2¼ BY 3¼ FOLDING Premoette, Jr., camera and complete developing outfit for a 6 volt, 20 watt generator, or three 6 volt, 60 amp. storage batteries; camera outfit cost $25. A H. Bennett, 1227 Darlingon Ave., Beaver Falls, Pa.

WILL EXCHANGE A ¼ H. P. MOTOR, IN good condition; runs at 1,600 r.p.m. on 115 V. D. C., and requires 2¼ amp for a ¼ H. P. 110 V. A. C. motor of reputable make in good condition. E. S. Dickerson, Jr., 121 W. Cedar Ave., Merchantville, N. J.

HERE IS THE VERY LATEST AND MOST valuable work on electricity for the amateur or practical electrician published: "Easy Electrical Experiments and How to Make Them," by L. P. Dickerson, 220 pages, 110 illustrations. 12mo., cloth binding. Price, $1.00 postpaid. Modern Publishing Co., 231 Fulton St., New York.

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WANTED—A 3 TO 6 H. P. 2 CYCLE GASOlene marine engine, coil and carburetor in exchange for Colt's 25 cal. automatic pistol, box of cartridges, Edison home phonograph, with seventy-one 2 and 4 minute records; 400 feet of new No. 12 copper wire, or will pay cash. C. Weller. Riverhead, N. Y.

TO EXCHANGE FOR ELECTRICAL GOODS: Little Hustler motor, home-made five point battery switch, six issues Modern Electrics, thirteen copies Popular Mechanics, five push buttons and a buzzer. T. F. Lane, 378 Richmond Ave., Port Richmond, S. I., N. Y.

THE PROCESS OF TRANSMITTING WIREless messages through the air over long distances by the aid of electricity is to countless thousands of people only a mysterious fairy tale, but here is a book for you, Mr. Operator, which states nothing but cold facts. "Operators' Wireless Telegraph and Telephone Hand Book," by Victor H. Laughter, 12mo., 210 pages, fully illustrated, giving the operator all the information he desires. Price $1,00 postpaid. Modern Publishing Co., 231 Fulton St., New York.

WILL EXCHANGE A 150-OHM WESTERN Electric Relay and a pair of 2000-ohm "Solid" receivers for a good "rotary spark gap" or a good stationary gap, with some other sending apparatus. Edward Shields, 419 18th St., Brooklyn, N. Y.

A $10 SET OF DIETZEN DRAWING INSTRUments in morocco case, T square, 2 triangles, French rule and drawing ruler all valued at $14; 22-calibre Stevens rifle, ⅜-in. spark coil, $3.00 Manhattan spark gap, Boston type key, Ferron type detector, strong 1/20 h. p. battery motor; quantity of 1-in. copper ribbon, value $23.00. Will exchange for either Holtzer Cabot 3200-ohms phones, Murdock 2400-ohms, Brandes Improved Navy Standard, or Wireless Specialty Co. phones, and Murdock rotary variable or spark coil. Sheldon Rose, 37 Blue Hill Ave., Roxbury, Mass.

THIS ELECTRICAL DICTIONARY WILL JUST fit in your vest pocket. Carry it around with you while you are at work. "Handy Vest Pocket Electrical Dictionary," by Wm. L. Weber, M.E., containing upwards of 4,800 words, terms and phrases employed in the electrical profession with their definitions given in the most comprehensive manner. Full leather cover; 50c postpaid. Modern Publishing Co., 231 Fulton St., New York.

WILL EXCHANGE A 4-BAR MAGNETO FOR A spark coil over 2 inches, and a spark gap. Arthur Shultze, 419 18th St., Brooklyn, N. Y.

OFFER FOR EXCHANGE $12 POCKET RELAY, fountain pen, $8 camera, $2 electric bicycle horn, $3 railroad relay, $2 learners' telegraph, $5 telephone, $6 receivers, 2000; $8 telegraph plug switchboard, ½-inch coil, Treco whistle, electrolytic detector, in good condition. E. P. Hough, Johnstown, N. Y.

HAVE 21 COPIES OF MAGAZINES FROM August, 1911, to July, 1913. All in good condition; cost, $3.15. Would like perikon set or small variable condenser, or something in receiving line. J. Keers, 224 81st St., Brooklyn, N. Y.

WILL EXCHANGE SENDING SET CONSISTing ¼ k. w. type E transformer, oscillation transformer, liquid condenser, and key, for Audion detector of Arnold or Wallace make. R. J. Cole, 1712 Silver St., Jacksonville, Fla.

BOOKS, AS A RULE, ARE FILLED UP WITH technicalities and are of very little use to the experimenter, but here is a book which is simple, plain and understandable. Send your order at once for your copy of "Electricity Made Simple," Clarke Caryl Haskins, 233 pages, 108 illustrations, 12mo., cloth binding. Price, $1.00 postpaid. Modern Publishing Co., 231 Fulton St., New York.

HAVE 1909, 1910, 1911 ISSUES OF MODERN Electrics Experimental Wireless Stations (Edelman), $2, Operators Wireless Telegraph and Telephone Handbook, $1; Induction Coils and Coil Making, $1; Electricity and Magnatismo, 50c.; How to Make Wireless Instruments, 25c.; How To Make a Wireless Set, 25c.; Model Making, 25c.; Amateur Mechanics, No. 1, 2, 3, 75c., and Mechanics for Young America, 25c., in exchange for wireless or electrical apparatus. Harold Callendar, 1731 Lincoln Ave., St. Paul, Minn.

HAVE A MAGNETO GENERATOR (FINISHED in red enamel). Has been used for watchman's signal; in good condition. Also 12 spring binding posts. Will exchange above for one good 2000-ohm Brandes's Superior type receiver. Wellington E. Christnagel, Ivoryton, Conn., Gen. Del..

HAVE $25 POCKET RELAY, NICKLE LEVER and key; hard rubber case and parts; fine learner's instrument; fine addition to wireless set for use with coherer; also as extension key to work transmitting set. Want audion, Brandes phones, large coil, ¼ k. w. transformer. E. R. Hough, Johnstown, N. Y.

HAVE A 12 H. P. GASOLINE ENGINE, TWOcylinder, four-cycle, air-cooled, Shoebler carbureter, tank and fittings, oilers, etc.; in exchange for a good sending wireless set or a closed core transformer or other wireless goods. Albert Massimo, Bellcourt, Bayside, L. I.

MR. AMATEUR! TO LEARN ELECTRICITY you should start from the beginning. You should know all about the minor details before you take on the big ones, and here is the book that is going to take you all the way through. "Elementary Electricity Up-to-Date," by Sydney Aylmer Small, M.A.I.E.E., 12mo., cloth, 500 pages, 206 illustrations. Price, $1.25, postpaid. This book starts on the primary characters of electricity and goes clear through to the end. Tells you all about storage batteries, condensers, flow of current, power of efficiency, etc. Modern Publishing Co., 231 Fulton St., New York.

HAVE THE FOLLOWING ARTICLES TO EXchange for wireless instruments: One rotary printing press and complete outfit; has two sets of type and prints 16 lines; cost $3.00; used very little. An L. E. B. pocket tool kit containing 47 tools, a ½-inch spark coil, complete, except case and vibrator. Total value, $6.50. Would like a 1½ or 2-inch coil. Allen W. Coven, 446 Earl Court, Elyria, Ohio.

WOULD LIKE TO EXCHANGE THE FOLLOWing for a pair of 2000-ohm "Brandes, Murdock or E. I. Co." telephone receivers: 9 Hubbell pull chain wall receptacles, value about $4.50; 1 lb. No. 34 D. C. C. magnet wire, value about $2.00; 1 telegraph sounder, value about 50 cents. B. Olsen, 736 E. 138d St., New York, N. Y.

BOUND VOLUME NO. 3 OF "MODERN ELECtrics" is now ready, which contains 740 pages, over 1,000 illustrations and writings of 300 authors, 650 articles of unusual interest, with 1,173 questions and answers. Bound in handsome black cloth, gold stamped. $1.50; $0.30 extra by mail. Modern Publishing Co., 231 Fulton St., New York City. (tf)

WILL EXCHANGE FIRST-CLASS STAMP COLlection valued at $40.00, containing about 3,000 all different stamps, for a first-class bicycle with coaster brake, etc. H. C. Osick, 329 Clark St., St. Charles, Mo.

WILL EXCHANGE RAPID BREAK, 400 AMpere, single pole single throw switch ($15.00) for complete rotary gap with 110 v., 60 c. A. C. induction motor; E. I. Co. 1,000 ohm phone and W. E. Co. 1,000 ohm phone for rotary variable condenser. Harry Downing, 2308 E. 57, Cleveland, Ohio (8 D. V.).

IT IS IMPORTANT THAT ALL INTERESTED in wireless should join the Wireless Association of America, which is helpful to those interested in any way in the wireless industry. For full particulars, address, Wireless Association of America, 231 Fulton St., New York. (tf)

FOR EXCHANGE 1 MESCO VARIABLE CONdenser, 1 Marconi one-half inch spark coil, 2 E. I. Co. old style enamel wire tuning coils, 1 E. I. Co. loose-coupler, 1 Bunnell 20 ohm sounder, silicon detector, rheostat, Mesco telegraph key, single leather covered headband, 75 ohm receiver, 2 S. P. S. T., 1 S. P. D. T., 1 D. P. D. T. switches, 1 rotary gap with 8 volt motor, 2½ pint Leyden jars; want 6-60 or 6-80 storage battery, rotary variable condenser, or Holtzer-Cabot 3,000 ohm phones. Howard Haines, 415 West 22nd St., New York City.

WILL EXCHANGE 2,000 OHM PHONES WITH head band (save the Republic), 1 variable rotary condenser, 1 large double slide tuner, 1 loose coupler D. S. on primary, 9 points on secondary, 1 universal detector and peroxide of lead detector; will exchange the above for Edgcomb-Pyle Jeweler's Special. Arthur Haake, Closter, Bergen County, N. J.

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WILL EXCHANGE 1½ IN. SPARK COIL, 250 volt, 25 amp. combination switch and cutout, 2 slide tuner, and jointed fishing rod for small gasoline engine or loose coupler and static machine in perfect order. Henry Stevenson, Post Office Box 1067, Wenatchee, Wash.

FOR EXCHANGE ONE 1-INCH WIRELESS coil, two slide tuner, silicon detector with mineral, fixed condenser in steps, and Brandes superior phone 1,000 ohms, with headband; would like ¼ or ½ kw. step up transformer (not home made). H. L. Miller, Jr., Box 47, Victoria, Mo.

WANTED ¼ KW. CLOSED CORE TRANSformer in exchange for 2 silicon detectors with silicon, 1 electrolytic detector, 1 Jr. fixed condenser, 2 double slide electro Jr. tuners, also a large assortment of telephones and parts, magnetos, receivers, transmitters, etc. Ralph Carnahan, 337 E. Church St., Urbana, Ohio.

WILL EXCHANGE ONE LITTLE HUSTLER motor, one Lyon & Healy B flat solo alto horn, ten boys' books and fifteen copies of magazines for B flat cornet or long barrel .22 revolver. Roy Curtis, Minden, Neb.

MODERN ELECTRICAL CONSTRUCTION, BY Henry C. Horstmann and Victor H. Tousley. A new revised and enlarged edition, 16mo., 358 pages, 178 diagrams. Pocket size, full leather limp. Price, $1.50 postpaid. Modern Publishing Co., 231 Fulton St., New York. (tf)

EIGHT IN. GEISSLER TUBE, REDOMETER, buzzer, sheet mica, flashlight, dating stamp, E. I. Co. complete wireless course, lightning arrester, hard rubber bushings, fuse block, D. P. S. T. fused, S. P. D. T. switches in exchange for 2,000 ohm phones with headband, No. 36 insulated wire or other electrical apparatus. Albert J. Weinsz, 327 W. 4th St., Canal Dover, Ohio.

HAVE STAMP COLLECTION WORTH OVER $4; will exchange for small battery motor, medical coil, 75 ohm receiver, or 5 ohm telegraph sounder. Wm. Wellman, 87 Thompson St., Stapleton, N. Y.

HAVE FOR EXCHANGE ¼ IN. SP. COIL, 2 spark gaps, electrolytic detector, tape recorder, ½ in. Bulldog type sp. coil, sending condenser, rheostat, 1/16 H. P. battery motor, detector, $7.50 perikon detector, $5 rotary printing press with type, automatic code teaching machine, coherer and decoherer, raw material, including binding posts, switch handles, rods, etc.; want pair good standard 2 to 4,000 ohm phones, or any receiving apparatus of Murdock or Clapp-Eastham make. Ben T. Elkins, St. Cloud, Fla.

WANTED 1 PAIR OF 2,000 OHM PHONES and a good detector in first-class condition in exchange for 1 pair 75 ohm phones, 1 glass plate condenser, 1 single throw switch, 1 one inch spark coil, all in good condition. John H. Schmeusser, Jr., 155½ Shrewsbury St., Worcester, Mass.

FOR SALE: 60 ACRES OF FINE LAND, ON Grand Island, N. Y., fronting on the beautiful Niagara River, right across from Buffalo; suitable for high grade development, bungalow plots, gentleman's estate or farming; nearly 600 feet shore front with riparian rights; price $300 per acre; worth $500; liberal terms will be made with responsible parties; house and barns near shore. Address W. H. Northrop, Grand Island, Erie County, New York.

FOR EXCHANGE CLAPP-EASTHAM $15 LOOSE coupler in good condition and other apparatus; would prefer Clapp-Eastham Blitzen loose counler. Paul C. Elliott, 162 East 66th St., New York, N. Y.

I HAVE THE FOLLOWING TO EXCHANGE for anything in the wireless or electrical line: 1 120 watt, 15 volts, 8 amperes dynamo; 1 Iver Johnson bicycle with Morrow brake and clincher tires, used but two years; 1 Corbin duplex coaster-brake; copper cut for a 600 volt, 100 ampere lightning switch and miscellaneous other articles. Edwin Pearson, 717 East 7th St., Duluth, Minn.

TO EXCHANGE—4 EDISON TYPE V. 150 A. H. batteries (just the thing for receiving), 1 helix frame with 40 ft. No. 6 aluminum wire, to exchange for 1 Knapp type S. dynamo motor, Brandes or Holtzer-Cabot phones. Elmer Freiwald, 1213 Helen Ave., Detroit, Mich.

HAVE EIGHT LATHE TURNED QUENCHED gap plates, one battery motor, $25 hot wire meter, special double point heavy duty key, high frequency buzzer costing $10, and ½ K. W. transformer with home made vibrator; in exchange will accept a medium sized dynamo and a vest pocket kodak or a small gasoline engine. John Stadler, 210 Plymouth St., Toledo, Ohio.

HAVE ½ K. W. CLOSED CORE TRANS. WITH secondary voltages of 220 and 55 on 110 v.; also have professional phones (2,000 ohms) with home made head band and 2-10 storage cell; want Thordarson step-up transformer or large spark coil. Robt. Enders, 222 Britain Ave., Benton Harbor, Mich.

WILL EXCHANGE ONE AUDIBLE ALPHABET code transmitter and seven records; also a lot of battery binding posts, nuts, washers, etc., for a film camera or a good achromatic telescope. Merton E. McClintock, 93 7th St., Salem, N. J.

HERE IS THE BOOK YOU ARE LOOKING for, written in plain English so it can be easily mastered by you whether you are an experimenter or an electrical engineer. "Practical Armature and Magnet Winding," by Henry C. Horstmann and Victor H. Tousley, 16mo., pocket size, leather cover. Price, $1.50. This book is the most valuable aid to the electrician, either in constructing or operating department. Modern Publishing Co., 231 Fulton St., New York.

WANTED — A PAIR OF HOLTZER-CABOTS, Western Electric, or Brandes 2800-ohm receivers. Howard Haines, 415 West 22d St., N. Y. C.

EXCHANGE COPY MODERN ELECTRICAL Construction, copies Saturday Evening Post, Cosmopolitan, System, Physical Culture, Fly, 5 Steam Engineer books, Hawkins; First and Second Aeroplane Books, Collins; for voltmeter, Electrician and Mechanic, bare or enameled wire, etc., for electrical goods. Spencer Page, 1027 E. Oxford St., Philadelphia, Pa.

WILL EXCHANGE RECEIVING OUTFIT, CONsisting of tuner, loading coil, 2 fixed condensers and silicon detector, for a good loose coupler, value about $8 or $9. Henry Muyskens, Jr., P. O. Box 194, Oak Harbor, Wash.

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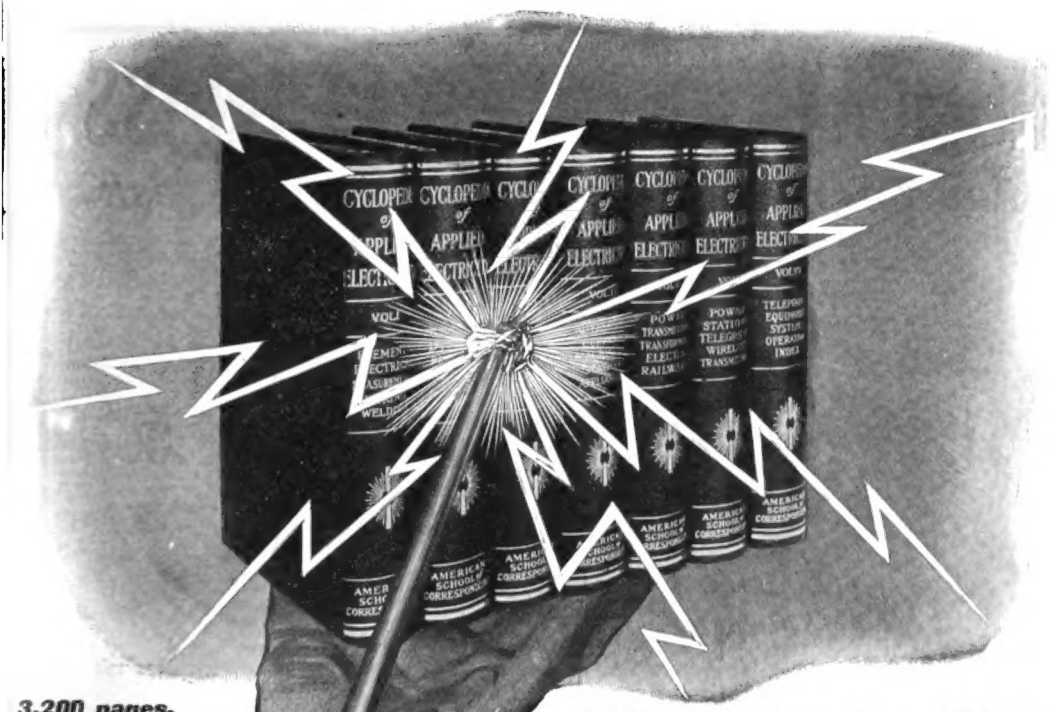

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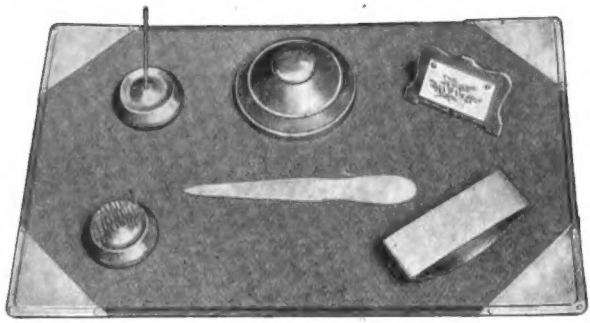

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